A Dissertation on

"LONG VERSUS SHORT AXIS ULTRASOUND GUIDED APPROACH FOR INTERNAL JUGULAR VEIN CANNULATION: A PROSPECTIVE RANDOMISED CONTROLLED TRIAL"

Submitted to the

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In partial fulfilment of the requirements

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ANAESTHESIOLOGY

GOVERNMENT STANLEY MEDICAL

COLLEGE & HOSPITAL

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY,

CHENNAI, TAMILNADU

APRIL 2013

CERTIFICATE

This is to certify that the dissertation entitled "**LONG VERSUS SHORT AXIS ULTRASOUND GUIDED APPROACH FOR INTERNAL JUGULAR VEIN CANNULATION:A PROSPECTIVE RANDOMISED CONTROLLED TRIAL"** is a genuine work done by **Dr . M.KUMARESAN** for the partial fulfilment of the requirements for M.D. (Anaesthesiology) Examination of The Tamilnadu Dr. M.G.R. Medical University to be held in April 2013, under my supervision and the guidance of **Dr.N.KRISHNAN , M.D., D.A.,** Professor, Department of Anaesthesiology at Stanley Medical College, Chennai.

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CERTIFICATE

This is to certify that the dissertation presented "**LONG VERSUS SHORT AXIS ULTRASOUND GUIDED APPROACH FOR INTERNAL JUGULAR VEIN CANNULATION:A PROSPECTIVE RANDOMISED CONTROLLED TRIAL**" herein by **Dr. M. KUMARESAN** is an original work done in the Department of Anesthesiology, Government Stanley Medical College and Hospital, Chennai in partial fulfillment of regulations of the Tamilnadu Dr. M.G.R. Medical University for the award of degree of M.D. (Anesthesiology) Branch X, under my supervision during the academic period 2010-2013.

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DECLARATION

I, **Dr. M. KUMARESAN** , Solemnly declare that the dissertation, titled "**LONG VERSUS SHORT AXIS ULTRASOUND GUIDED APPROACH FOR INTERNAL JUGULAR VEIN CANNULATION : A PROSPECTIVE RANDOMISED CONTROLLED TRIAL"** is a bonafide work done by me during the period of April 2012 to September 2012 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of **Dr. P. CHANDRASEKAR, M.D, D.A.** Professor and Head, Department Of Anaesthesiology, Government Stanley Medical College, Chennai. This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.D. degree examinations in Anaesthesiology to be held in April 2013.

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CONTENTS

INTRODUCTION

In 1940's ultrasound was introduced in the clinical practice by Dr. Karl Dussik [1], an Austrian psychiatrist. He studied the brain for tumors and he termed the images hyper phonography. In 1978 first clinical use of ultrasound for anesthesia was used for peripheral nerve blocks by LaGrange et al[1].

Internal jugular vein cannulation procedure is routinely performed by anaesthesiologists. Traditionally, anatomical surface landmark-guided technique has been used for IJV cannulation. This approach has many complications[2,3] like bleeding, hematoma, arterial puncture, and pneumothorox [4, 5].

The use of the ultrasound in clinical practice enhances the quick, safe and reliable guidance for needle placement into the internal jugular vein, in elective routine and difficult cases. The level of evidence for ultrasound guided central venous cannulation is class A, level 1.[24] Previous studies were comparing the blind landmark guided technique versus ultrasound guided cannulation of the internal jugular vein.

The ultrasound image of the internal jugular vein may be orientated along either short axis (cross-sectional view) or long axis (longitudinal view) [6]. In this study we are comparing the two axes (short vs. long) of the ultrasound view for cannulation of the right internal jugular vein.

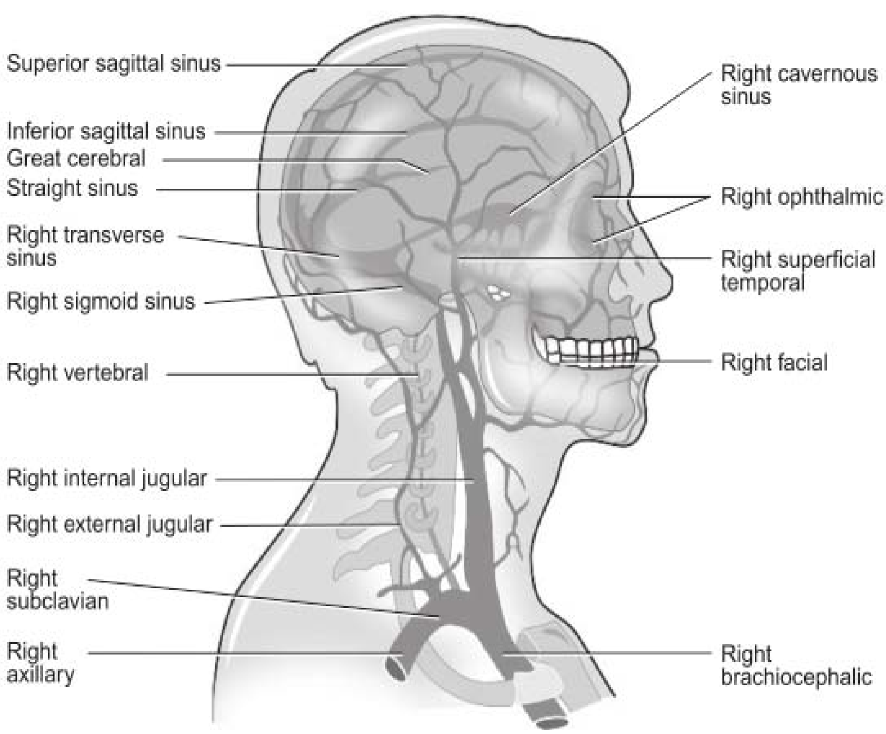
AIM OF THE STUDY

The aim of the study is to compare the first pass success rate of ultrasound guided short axis versus long axis cannulation of the right internal jugular vein.

INTERNAL JUGULAR VEIN ANATOMY

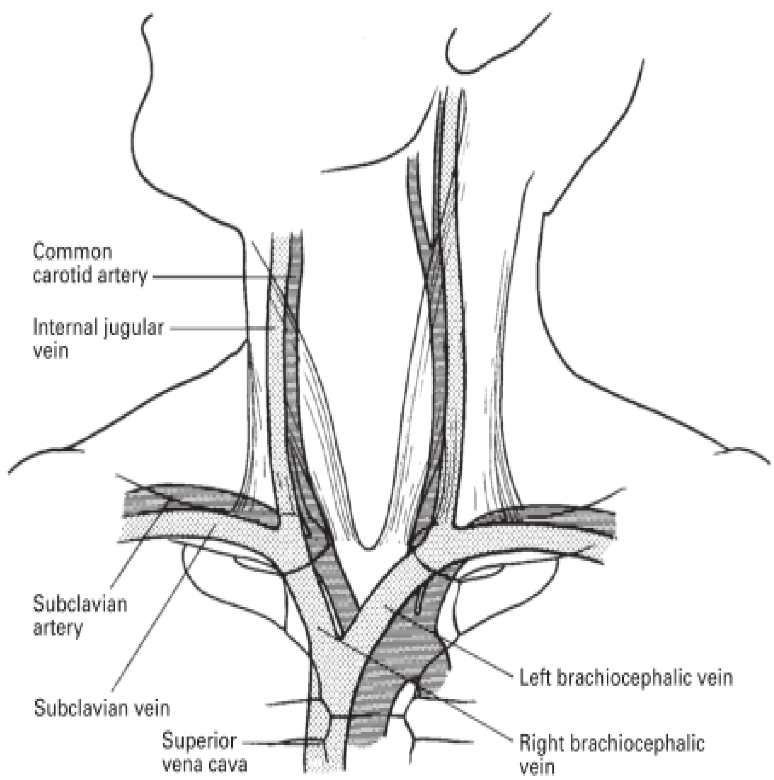
The internal jugular vein is the continuation of the sigmoid sinus and originates from the jugular foramen at the base of the skull. It joins the subclavian vein behind the sternal extremity of the clavicle to form the brachiocephalic vein [7]. (fig.1)

Figure: 1



The vein lies superficially in the anterior triangle of the neck with in the carotid sheath where the carotid pulsations are usually visible as well as palpable. The IJV initially lies lateral to the internal carotid artery, and then to the common carotid artery. It is also superficial to external carotid artery in the anterior part of the neck. It then descends deeper to the sternocleidomastoid muscle.[7] (fig.2)

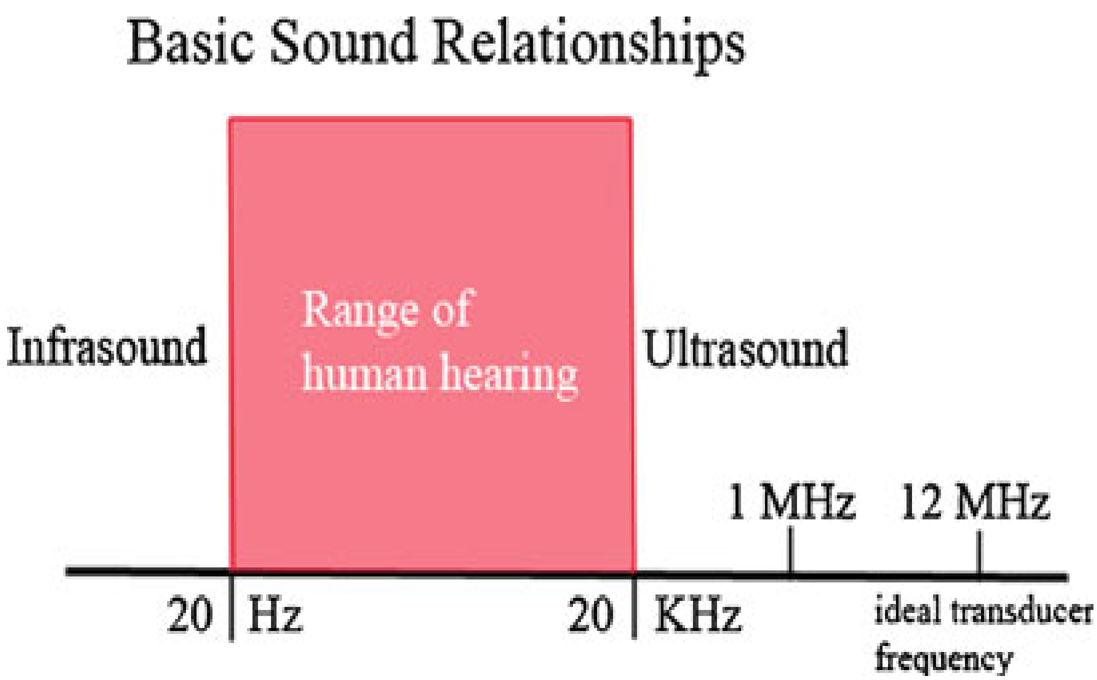
Figure: 2



Basics of Ultrasound

Ultrasound[8] is defined as frequencies of sound waves above 20000 cycles/sec (20 KHz) - which is not audible to the human ears. Medical diagnostic ultrasound uses frequencies between 1-10 MHz's (fig.3)

Figure: 3

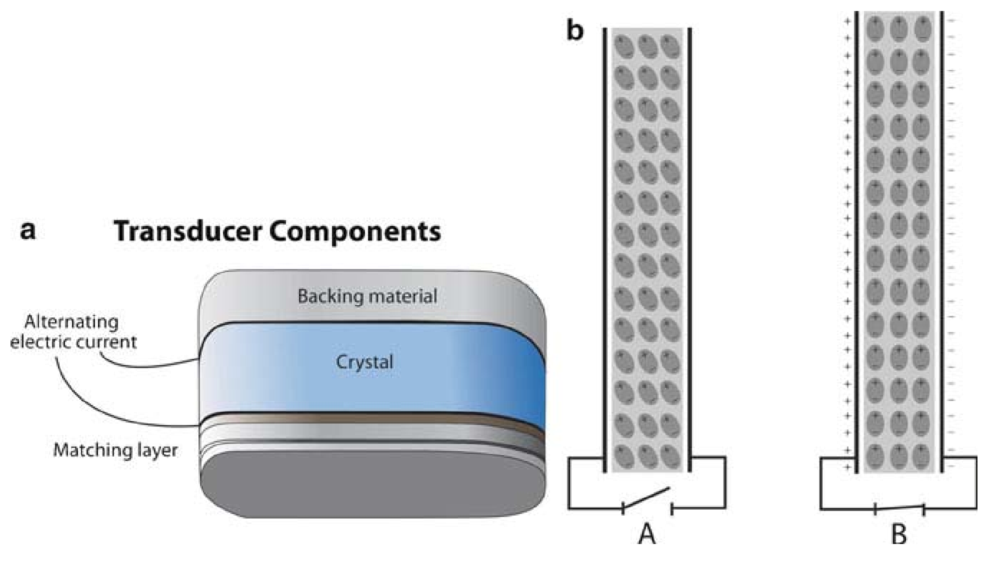


The Ultrasound Transducer − Source of waves and Image[8]

Each ultrasound transducer is required to create a source of waves, which when applied to the human skin safely penetrates the tissues and receives the waves reflected back to the transducer from the tissues.

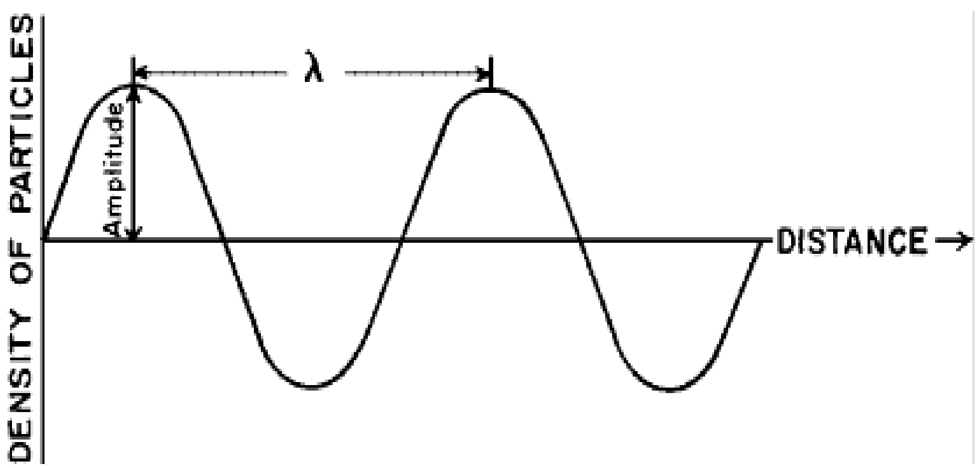
To generate the ultrasound waves, an electrical current is applied to the crystal (piezoelectric crystal) component within the transducer (fig.4). The current is converted to mechanical (ultrasound) energy and transmitted to the tissues at very high frequency (megahertz) waves.

Figure: 4



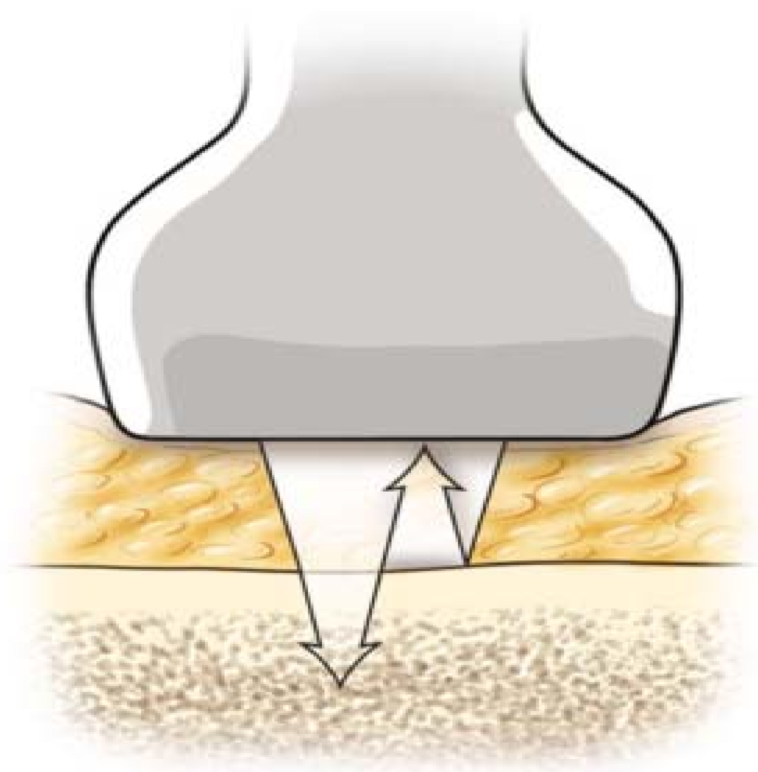
The ultrasound energy produced then travels through the tissues as pulsatile, longitudinal, mechanical waves originating from the transducer contacts the skin (fig.5).

Figure: 5



The transducer (or a ‘probe’) is potentially the most limiting component of any ultrasound scan, as it determines the characteristics of the energy that is produced, received, and subsequently processed for anatomical representation on the monitor (fig.6).

Figure: 6



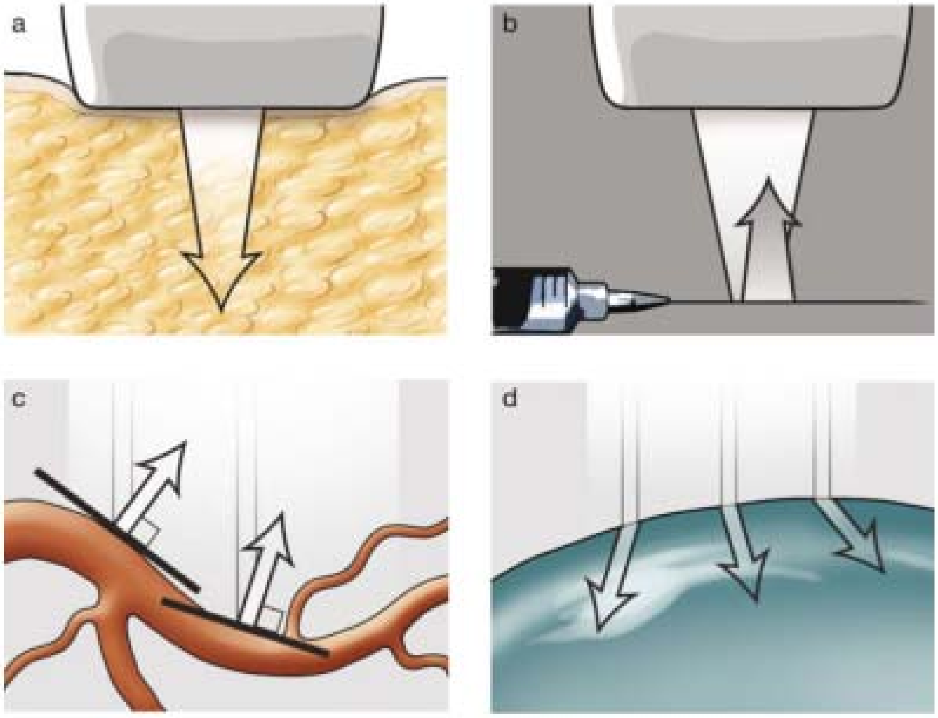
Resolution

Our ability to ‘visualize’ the anatomy depth to the transducer in contact with the skin surface is dependent on the potential resolution. Resolution is determined by the extent to which the energy that leaves the transducer penetrates the tissues and returns to the transducer to accurately represent the anatomical structures below.

Once the vibrational ultrasound energy leaves the piezoelectric crystalline face of the transducer, it is immediately and progressively degraded while it contacts and enters the tissues.

This concept of emitted energy that is lost (not returned to the transducer) is known as the attenuation of ultrasound energy. It can occur due to many reasons like absorption, reflection, scattering, or refraction of the ultrasound waves (fig.7).

Figure: 7



a) Absorption

b) Reflection

c) Scattering

d) Refraction

The degree of ultrasound energy attenuation is directly proportional to the frequency of the energy emitted and total distance of the ultrasound signal must travel in returning to the transducer from a structure of interest.

This attenuation of the emitted ultrasound energy may contribute to produce distortion or misrepresentation of anatomical relationships characterized on the ultrasound monitor screen image.

While examining the anatomical representations of the two dimensional ultrasound, our resolution is determined by the ability to differentiate structures in the ‘X-axis (horizontal) and ‘Y-axis (vertical).

In the ultrasound imaging language, these are described as Lateral Resolution and Axial Resolution respectively.

Lateral Resolution describes the potential to visualize two structures that are in a plane perpendicular to the direction of the ultrasound wave. This is the ability to visualize two structures at the same tissue depth relative to the face of the ultrasound transducer in contact with the skin that is appearing ‘side-by-side on the screen. Lateral resolution can be improved by increasing the frequency or diameter of the ultrasound transducer.

Axial Resolution describes the potential to visualize two structures that are situated in a plane parallel to the ultrasound wave. These are structures located at different tissue depths relative to the face of the ultrasound transducer that is one object appears ‘above’ the other on screen. Axial resolution may be improved by selecting transducers with higher frequencies.

Both lateral and axial resolution are improved with higher frequency transducers, ultrasound energy is progressively degraded as it travels further through tissues. This degree of attenuation or loss is proportional to the frequency of the energy applied.

Higher frequency energy is ‘lost’ to the tissues at a greater extent than lower frequency energy with progressive tissue penetration. Irrespective of frequency, lateral and axial resolutions always decrease with increasing in tissue depth (fig.8).

Figure: 8

For the lateral and axial resolution of superficial structures, ultrasound image should be performed with highest frequency transducer available. While imaging deep anatomical structures, lower frequency transducers is less attenuated, allowing more energy return to the transducer, and generating a better representational image. To optimize the balance of resolution and penetration, select the highest frequency transducer that will provide the necessary tissue penetration characteristics.

The resolution of a deep structure using a low frequency transducer will not be equivalent to the resolution of the superficial structure with a high frequency transducer. However, this will be better than imaging the same structure using with the high-frequency transducer.

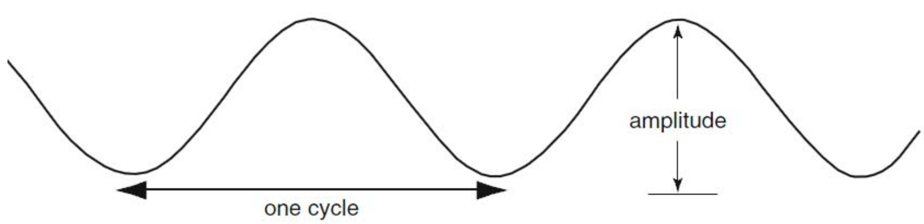
Selecting an Ultrasound Transducer

Frequency is the key property of each transducer, as it greatly determines what ultrasound screen image representation is possible for any given anatomical territory. In addition, transducers are also used to describe by their Array Configuration, and their physical Footprint.

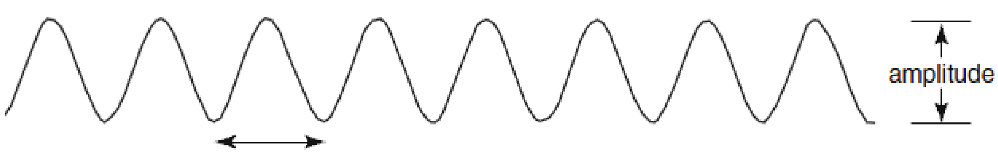
With their respect of frequency, transducers may be identified by frequency range. They are categorized as high, mid, and low-frequency transducers (fig.9).

Figure: 9

LOW-FREQUENCY



HIGH –FREQUENCY



Transducers usually characterized as ‘high-frequency’ operates above 10 MHz and are best suited to visualize, superficial structures less than 3 cm from the surface of the skin.

These transducers have excellent resolution for superficial structures. But with increasing depth, structures are less readily visualized due to attenuation of the emitted and returning ultrasound energy.

These high frequency transducers are commonly selected for examinations of superficial structures such as the interscalene brachial plexus, peripheral nerves, or superficial vessels.

Mid-range transducers are typically 5-10 MHz, and they are used for imaging structures for approximately 3-6 cm below the skin surface. Although these transducers do not have the potential resolution capabilities of the high-frequency transducers for structures close to the surface, they provide better resolution at these tissue depths.

Mid-range transducers are commonly selected for deeper structures such as imaging of the infraclavicular brachial plexus, sciatic nerve, or deeper vascular structures.

Low frequency transducers are usually described those operating below 5 MHz's they are specifically used to provide resolution of structures at even deeper tissue planes.

Although not as commonly used perioperatively as the other transducers, they are very useful for imaging in the ante natal scans, spine, or in patients presenting with an increased body mass.

The Array Configuration refers to the arrangement of elements along the surface of the transducer, which can take the form of a linear array or curved array relative to the scanning surface.

Linear Array transducers are characterized by a narrow series (<1mm) of piezoelectric elements, they are arranged in a line along the middle of a flat-faced transducer. As the ultrasound energy is emitted along the line of piezoelectric crystals, it usually provides anatomical visualization that is the same width at the skin surface in contact with the transducer as at greater tissue depths. The width of the ultrasound screen image reflects the scaled width (diameter) of the transducer itself, providing a relatively uniform field of visualization (fig.10).

Curved Array transducers are characterized by a similar narrow line of piezoelectric elements aligned along the midline of the face of the ultrasound transducer. However, the surface of the transducer is convex (curved) rather than flat (fig.10).

This creates the ultrasound energy in to a fan-like beam that widens with increasing penetration depth. This results in a visualized anatomical field that is wider with progressive depth from the surface.

The advantage of this type of curved array configuration is realized when structures of interest are deep to obstructing superficial anatomy (such as bone); the fan-like window allows a wide field and depth from a narrow window near the skin. These configurations are very useful when imaging around objects such as the clavicle or spinous processes.

Although the curved array transducer has the advantage of a wider field of view relative to transducer footprint, with increasing tissue penetration depth and there is somewhat reduction in the lateral resolution compared to a linear array transducer of same frequency and diameter.

Figure: 10

The third identifying feature of the transducer taken into clinical consideration is the Footprint, or diameter of the transducer itself. The footprint of the transducer is selected to allow optimal scanning and needle placement within the anatomical surface confines of each patient.

The ideal combination of transducer footprint, array configuration, and frequency is based on superficial and deep anatomical patient characteristics to allow for acquiring the optimal scan image and subsequent needle intervention.

Artifacts

Artifacts that may cause the observer to be unaware of structures that are hidden or perceive structures on screen that really do not anatomically exist.

Acoustic Shadowing occurs when structures that are highly attenuating of ultrasound energy (example: bone) produce a shadow immediately deep to the structure and the ultrasound energy is only partially transmitted through. This type of acousting shadow is clinically important because it may falsely appear on the screen as an image that there are no anatomical structures located in the area of the ultrasound beam.

Enhancement Artifact occurs when ultrasound energy passes through a structure that is less attenuating compared to adjacent tissues. Tissues beyond lower attenuating structures (example: bladder, blood vessels) are visually enhanced due to the relatively greater energy in the signal as it contacts those surfaces and is returned to the transducer. Enhancement artifacts may present the visual screen representation of a structure that does not exist.

Reverberation Artifact is a common artifact that is due to the ultrasound waves striking the surface that is closely perpendicular to the incoming energy. Every successive ultrasound wave emitted from the transducer produces an echo, resulting in a series of parallel lines both above and below the actual object. This is usually seen with highly attenuating wide-bore needles.

Doppler imaging, the blood flow towards or away from the transducer results in a image that differentiates blood flow from the rest of the static tissue by using colour to the area of flow within the vessel.

The ultrasound energy produced will be returned to the transducer at a different frequency depending whether it encounters flow towards or away from the ultrasound source energy. This effect is known as the Doppler shift.

Blood flow towards the ultrasound source reflects energy at a relatively higher frequency that is positive Doppler shift, and at a relatively lower frequency that is negative Doppler shift, while the flow is away from the transducer.

Using Colour Doppler mode, flow of blood towards the transducer will be indicated in red and flow of blood away from the transducer will appear blue on screen.

Techniques of Internal jugular vein cannulation[9]

In the Anatomical landmark-based cannulation of the internal jugular vein technique, the surface landmarks are routinely used. They are divided into high and low approaches. The high approach is classified as being at or above the level of cricoid cartilage.

Various studies conclude that there is no single reliable and safe route of internal jugular vein cannulation. The rate of carotid puncture was found to be high in this procedure[3, 5.]

It is for all the above reasons that ultrasound guided insertion of central venous catheters into the IJV is now recommended as the preferred method in adults and children. Furthermore, ultrasound can be used in most emergency clinical situations where central venous catheterisation is needed.

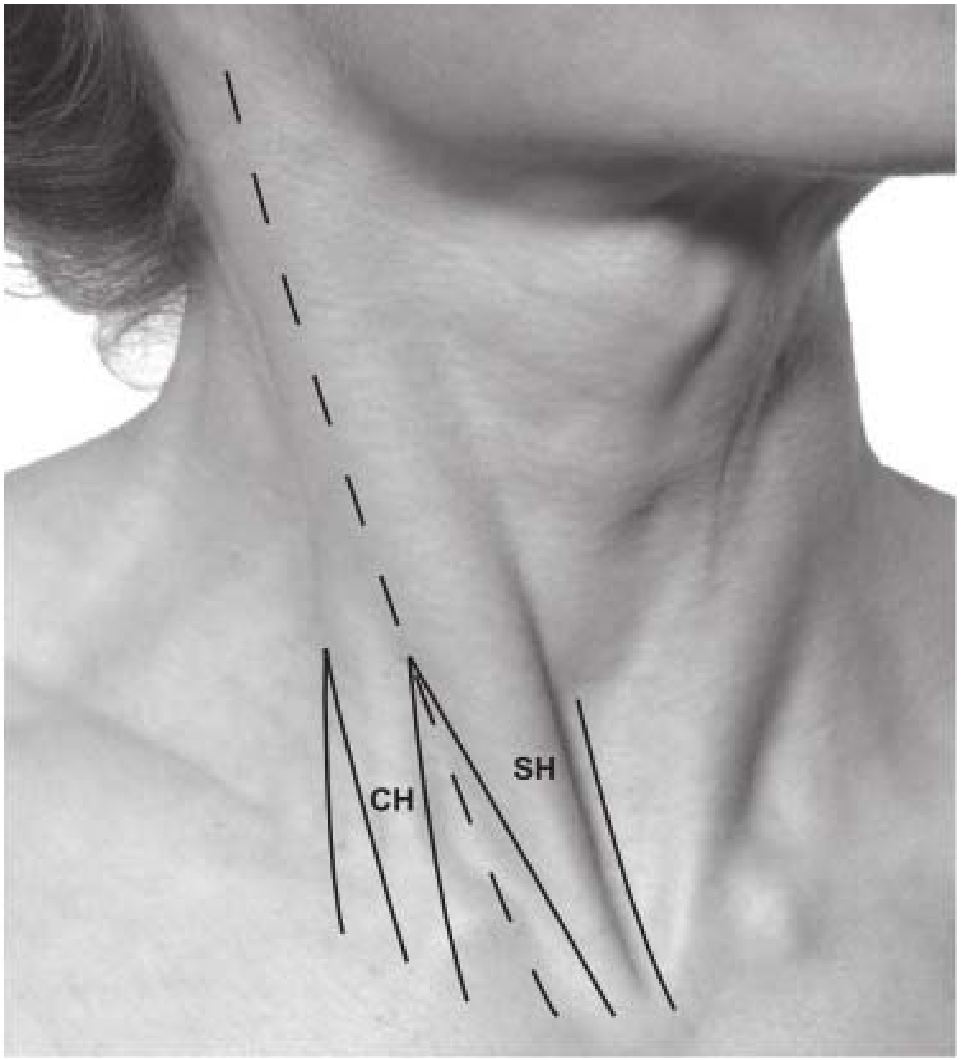
Basic technique for IJV cannulation [9]

1) Landmark technique or Blind technique

Strict aseptic precautions should be followed by using 2% chlorhexidine in alcohol for skin preparation. The patient is put in Trendelenburg position, that is, 10º head down tilt to distend the vein. The head is rotated away from the side of cannulation. The catheter is prepared and checked for patency.

The IJV lies in the groove between the sternal and clavicular head of the sternocleidomastoid muscle lateral to the carotid artery. The point of needle entry is at the apex of the triangle formed by the two heads of the sternocleidomastoid muscle with the needle directed towards the ipsilateral nipple (fig.11).

Figure:11



The carotid artery pulsation is felt by the non-dominant hand and the needle is inserted laterally to avoid carotid puncture. Using smaller finder needle increases the margin of safety.

A 5ml syringe is attached to 18G, 2.5 inch needle and is approached to the skin plane at a 30° angle. The needle is advanced with gentle aspiration and non-pulsatile venous blood entering into the syringe will confirm the entry into internal jugular vein.

Once the internal jugular vein is identified the needle is held still and the syringe is detached from the needle. A J tipped soft flexible guide wire is inserted into the needle. The wire should be advanced easily into the vein without any resistance. The ECG is monitored continuously to detect arrhythmias if the tip of the guide wire is inserted too far and is in contact with the right atrium.

The puncture site is enlarged with an 11 size blade to accommodate the greater size catheter. A firm tapered tip vessel dilator is inserted to dilate the subcutaneous tissue around the guide wire to facilitate the placement of catheter smoothly.

The vessel dilator is removed and the catheter is railroaded over the guide wire into the internal jugular vein to a depth of approximately 15 – 18 cms so that the tip lies at the junction of the superior venacava and the right atrium. The guide wire is withdrawn and the catheter fixed with sutures. Sterile dressing is applied and patency of lumen is checked once again with heparinized saline.

All lumens should be locked with luer- lock connector to prevent air embolism. The position of the catheter should be checked on a chest radiograph after the procedure.

2) Ultrasound guided IJV cannulation[8,9]

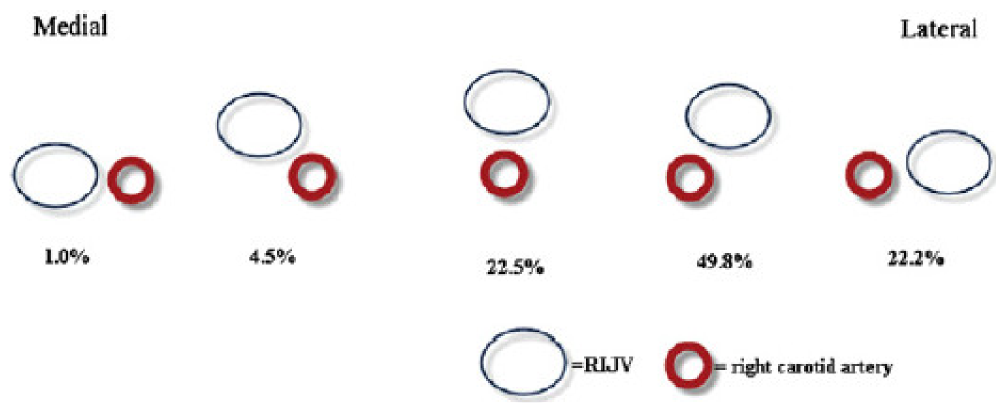
The orientation of the probe and display setup is done by touching the probe on one side. The movement is seen on the display and the side of the marker is identified. The marker on the screen and probe should correspond with the same side. This helps in a left or right orientation of the display. Usually marker is placed in left orientation.

There are two techniques in the ultrasound guided cannulation, one is the use of needle guides and another one is the free hand puncture. Routinely the free hand technique is practiced for ultrasound guided cannulation.

The USG guided cannulation is clinically divided into four steps. That is Prescaning, preparation, prick and path. This can be simply remembered as 4 P's.

Prescan is done for to check the patency and rule out the thrombosis of the vein and also to measure the diameter of the vein, because diameter less than 0.7 cm reduces the success rate. Prescan is useful to select the site of needle prick, where the IJV and carotid artery overlap is minimal. Variable overlap between IJV and carotid is shown in (fig 12).

Figure: 12



Strict aseptic precautions should be followed by using 2% chlorhexidine in alcohol for skin preparation. The real time 2D ultrasound guided internal jugular cannulation requires 10 MHz transducer probe. The probe is protected with a sterile sheath and a sterile jelly is used to improve the contact of the transducer to the skin.

The operator holds the ultrasound probe in the non-dominate hand to obtain a view of the target vessels. The artery and vein are differentiated by ultrasound by

Arteries

- Pulsatile
- Round shape
- Non compressible

Vein

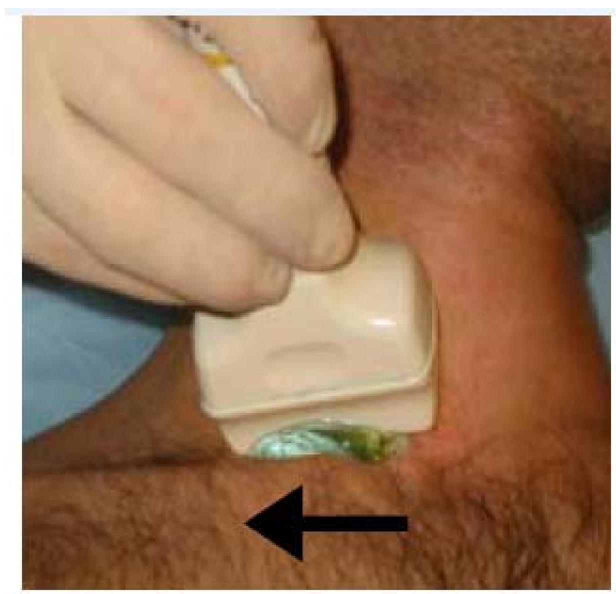
- Non pulsatile
- Elliptical in shape
- compressible

By using ultrasound guidance either the transverse (short axis) or the longitudinal (long axis) views are obtained.

Short-axis approach

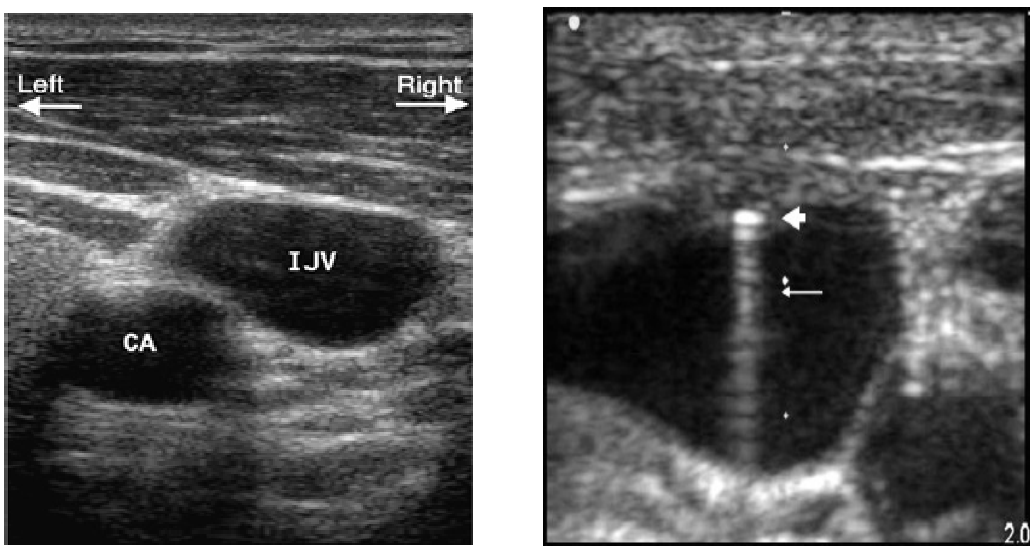
The ultrasound probe is placed perpendicular to the great vessels of the neck and a cross sectional view of the vein is obtained. In this view both the artery and vein are simultaneously seen and the differentiating features are verified before passing the needle. (Fig 13)

Figure: 13



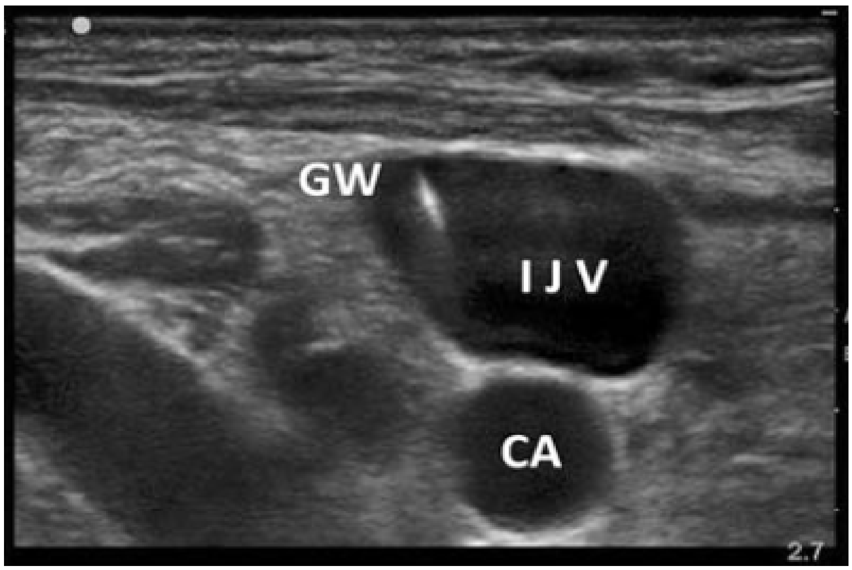
The vein is positioned in the centre of the ultrasound screen. An important relationship is present between thyroid, carotid and IJV, Which is the presence of the thyroid gland, carotid medially and the IJV laterally. The vessel is punctured under direct vision with 18G needle. The needle is passed out of plane to the probe advancing at an angle (45°) until the tip of the needle is visualized as a white dot. (Fig 14)

Figure: 14



In this view the entire needle is not seen. Only the tip of the needle can be visualized. The puncture of the internal jugular vein is confirmed by aspiration of non-pulsatile venous blood. The guide wire and catheter placement are done by Seldinger technique (fig.15).

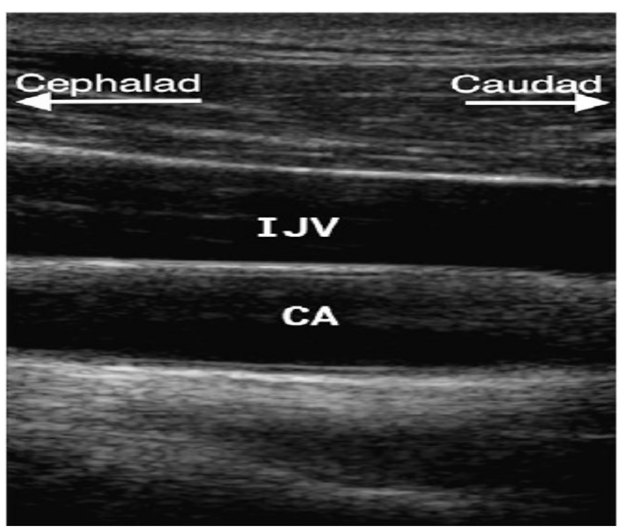
Figure: 15



Long-axis approach

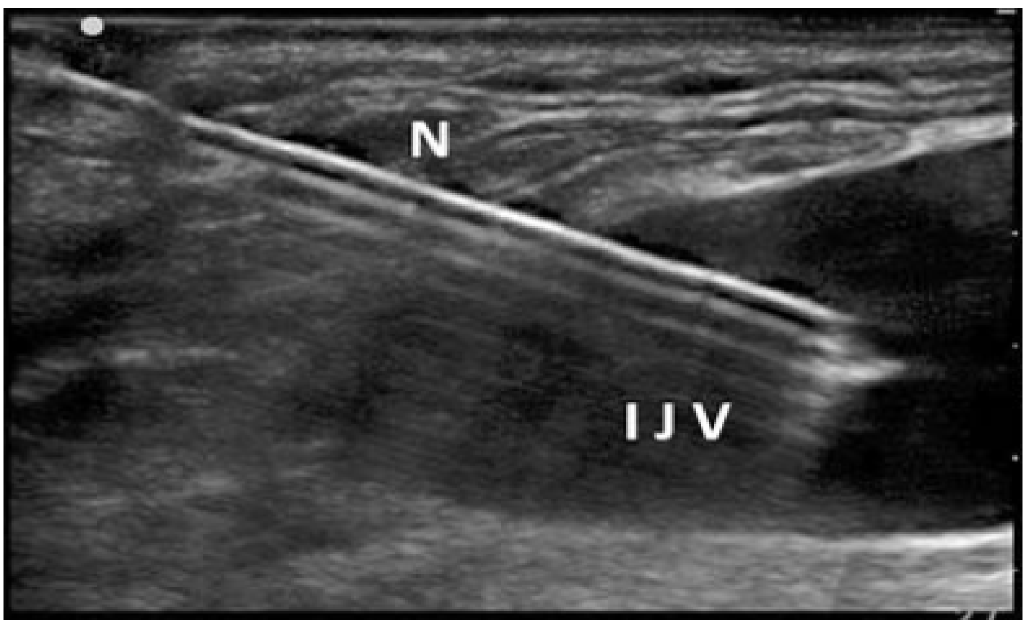
The ultrasound probe is at first placed perpendicular to the great vessels of the neck and a cross sectional view of the vein is obtained. The vein is positioned in the centre of the ultrasound screen and the probe is then rotated through 90° to get a longitudinal view of the vein. (Fig 16)

Figure: 16



The needle is passed in plane to the probe advancing at an angle of 30° until the entire length of the needle is visualized entering into the vein. The puncture of the internal jugular vein is confirmed by aspiration of non-pulsatile venous blood. The guide wire and catheter placement are done by Seldinger technique (fig.17).

Figure: 17



INDICATIONS FOR PLACEMENT OF CVC

1. Central venous pressure monitoring
2. Rapid infusion of intravenous fluids and blood
3. Administration of vasoactive or irritating drugs
4. Chronic drug administration such as chemotherapy
5. Pacemaker insertion
6. Haemodialysis
7. Aspiration of air emboli
8. Total parenteral nutrition
9. Pulmonary artery catheterisation and monitoring
10. Inadequate peripheral venous access

CONTRAINDICATIONS

ABSOLUTE

1. SVC syndrome
2. Local infection
3. Renal carcinoma invading into right atrium
4. Ipsilateral Carotid Endarterectomy

RELATIVE

1. Coagulopathy (INR >1.5)
2. Atherosclerotic carotid artery
3. Previous cannulation of IJV same side

COMPLICATIONS

1. Pneumothorax
2. Hemothorax
3. Arterial puncture/catheterisation
4. Cardiac arrhythmias
5. Air embolism
6. Catheter-related sepsis

REVIEW OF LITERATURE

1. **Dimitrios Karakitsos** [10] et al ;(Critical Care 2006, 10:R162)

In their study the authors compared the real time ultra sound guided cannulation of the internal jugular vein cannulation and the standard landmark guided technique in two groups of 450 critical care patients. Success rate of Cannulation of the internal jugular vein by using ultrasound was 100%versus 94.4% ($p < 0.001$).

Average skin to vein time and the required number of attempts were reduced in the ultrasound group, compared with the landmark group ($p < 0.001$). In the landmark group, the complication rates were 10.6, 8.4, 1.7, and 2.4 % of carotid artery puncture, hematoma, haemothorax and pneumothorax respectively. The complications were statistically significant compared with the ultrasound group ($p < 0.001$).

2. **Dodge KL** [11]et al; (J Ultrasound Med. 2012 Oct; 31(10):1519-26.)

The authors compared the ultrasound guided central venous catheter insertion versus landmark technique among junior residents. This study was totally done in 480 patients by 115 residents. Successful first cannulation was 27% in landmark compared to 49% in the US-guided ($P < .01$) technique. Overall success rate was 55% of landmark compared to 80% for US-guided ($P <.01$) technique. The authors concluded that US guidance was associated with increased first cannulation success compared to the landmark technique.

3. **Keenan SP** [12] et al; (J Crit Care. 2002 Jun; 17(2):126-37.)

The authors compared the use of ultrasound guided central venous cannulation with the landmark technique in critically ill patients. The first attempt success rate was higher using ultrasound (risk difference, 24, 95% CI,.08-.39).

4 . **Akoglu H [13], et al;** (Nephrology (Carlton). 2012 Sep; 17(7):603-6.)

The study was conducted in 323 patients who require the internal jugular vein cannulation for dialysis. The authors found that the first pass success rate was80.8% and complication rate was around 3.2 %. The authors conclude that Cannulation of IJV under real-time ultrasound guidance is very safe with high technical success rates.

5. Susan T Varghese [14] et al ;(Anesthesiology: July 1999 - Volume 91 - Issue 1 - p 71–77)

The authors studied 52 infants in landmark guided and 43infants in ultrasound guided cannulation.in their study 100% success rate in ultrasound guided technique versus 76.9% in landmark guided approach. Carotid artery puncture was nil in ultrasound guided cannulation versus 25% in the landmark guided approach. Significant reduction in number of attempts and cannulation time was observed in this study by this author. They concluded USG guided cannulation of IJV in infants was safe, easy and precise, alternative to the landmark method. Anatomic variations of the IJV and carotid artery puncture in the infant neck are minimized by ultrasonography visualization.

6. Julle leung 15 et al; (Emerge Med. 2006 Nov; 48(5):540-7)

In this study the authors compared the real time ultrasound guided IJV cannulation versus traditional landmark technique in the emergency setting.130 patients were included for this study , they found that USG guided cannulation success rate was 93.9% versus 78.5% in landmark guided technique. First pass success rate was around 82% in USG guided versus 70.6% in landmark guided technique.

Complication rate was around 4.6% in USG guided versus 10.8% in landmark guided technique. The authors conclude that the ultrasound guided cannulation of IJV in the emergency setting was associated with higher success rate and lower complication rate

7. **Slama M 16** et al; (Intensive Care Med. 1997 Aug; 23(8):916-9.)

In this study the authors compared the real time USG guided IJV Cannulations versus traditional landmark technique in the ICU setting.79 patients were included for this study. They found that USG guided cannulation success rate was 100% versus 76% in landmark guided technique. First pass success rate was around 43% in USG guided versus 26% in landmark guided technique.

The authors conclude that the USG guided technique improved the success rate of IJV cannulation in ICU patients, and should be used when the IJV has not been successfully cannulated within 3 min by the landmark-guided technique.

8. Mey U [17] et al**; (**Support Care Cancer. 2003 Mar; 11(3):148-55. Epub 2002 Oct 23.)

In this study the authors compared the ultra sound guided cannulation of internal jugular vein cannulation over the classic landmark-guided technique. This study included 493 patients who required central line for various purposes. This study result shows that the first pass success rate was around 87.6% and overall success rate was around 94.5%. Carotid artery puncture rate was around 1.4%. The authors concluded that USG guided central venous cannulation of the IJV provides high success rates. The authors insisted that the experience of the physician acting as sonographer is an important factor for the above success rate.

9. Gerardo Duran [18] et al; (Cir 2010; 78:418-421)

In this study the author used high resolution ultrasound for central line cannulation. In this study the first pass success rate was around 87.5%. Average time required for the cannulation was around 5 min and nil complication rates in this study. The author concluded that time required was minimal and reduced complication rate.

10. BALIVAS[19] et al;(EMERG MED d December 2003, Vol.10, No. 12)

In this study the authors compared short-axis versus long-axis ultrasound approach in an inanimate model for line placement. A gelatin model providing a realistic Ultrasound image was placed inside a synthetic arm that was used for training phlebotomists .The artificial venous canal was filled with red coloured fluid.

After a 30-minute tutorial on Ultrasound-guided vascular access, Emergency Medicine doctors were randomized in to two groups. Group one tried Short axis first followed by Long axis. Group two tried Long axis first followed by the Short axis. Time for vein cannulation, number of needle attempts, and difficulty of access reported by doctors were recorded. 17 Emergency Medicine doctors participated.

The mean times for vein cannulation in Short axis and Long axis were 2.36 minutes and 5.02 minutes respectively ($p = 0.03$). The mean numbers of skin breaks in Short axis and Long axis were 4.18 and 5.76 respectively ($p = 0.49$). The mean numbers of needle attempts for the Short axis and Long axis were 13.71 and 18.17 respectively ($p = 0.51$). The mean difficulty scores in Short axis and Long axis were 3.99 and 5.86 respectively ($p = 0.17$). The authors concluded that the vascular access in the SA view was faster than the LA view in an inanimate arm model.

11. Suresh Chittoodan [20] et al; (.Medical Ultrasonography 2011, Vol. 13, No. 1, 21-25)

The authors compared the two approaches, SA (short axis) approach to the LA (long axis) approach for right IJV cannulation in two groups of each 50 subjects. In the SA group, the first pass success rate was 98%. In the LA the first pass success rate was around 78%. In both the SA and LA groups the overall success rate of IJV cannulation was 100%. Time needed for guide wire placement was 39.6 ±18.4 versus 46.9 ± 42.4 seconds in SA and LA group. 4% of patients in the LA group had complication of the carotid arterial puncture. The authors concluded that the cannulation was easier with less or no arterial puncture in the short axis view.

MATERIALS AND METHODS

The materials needed for the study includes,

1. Ultrasound machine with high frequency probe (10 MHz).
2. Sterile gel, sterile transducer cover
3. Central venous catheter
4. Monitors – pulse oximeter, ECG, NIBP
5. All emergency drugs

STUDY DESIGN

This study was a single blinded, randomized comparative study conducted in Government Stanley hospital, Chennai during the period of April 2012 to September 2012. After obtaining clearance from the Institutional Ethical Committee of the Stanley Medical College, Chennai-3, a pilot study was done to calculate the sample size.

A pilot study with a sample size of 5patients in each group was done before the start of the study to decide on sample size. The sample size calculated based on the formula given in monographers on statistics and applied probability.[21, 22]

Formula:

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 \, 2s^2}{d^2}$$

Where

$Z_{1-\alpha/2}$ = 1.96 (5% alpha level of significance)

$Z_{1-\beta=}$0.842 (80% power)

D = difference between two means

S = S_1+S_2 / 2

On entering the values, the mean time for insertion observed in the pilot study for short axis technique was 59.2 ± 9.2 seconds, and for long axis technique was 64.4±10.8 seconds.

$$N = 2 \text{ X } (1.96 + 0.842)^2 (9.2+10.8/2)^2 / (64.4 - 59.2)^2$$

$$N = 2 \text{ X } 7.85 \text{ X } (20/2)^2 / (5.2)^2$$

$$N = 15.7 \text{ X } (10)^2 / 27.04$$

$$N = 15.7 \text{ X } 100/ 27.04$$

$$N = 58.062$$

Sample size taken as 60 patients, 30 in each group.

30 patients were included in each group. After proper screening for the inclusion and exclusion criteria, the patients were informed about the purpose of the study and the procedure. An informed consent was obtained.

CRITERIA FOR SELECTION

INCLUSION CRITERIA

1. Adult patients age more than 20 years
2. Patients needed central vein cannulation

EXCLUSION CRITERIA

1. Bleeding disorders and on anti-coagulant treatment
2. Abnormal neck anatomy
3. Morbid obesity
4. Local infection

The selected patients were randomly assigned to two groups labeled as S and L. Each group was allotted 30 patients. Randomization was achieved by allotting lots with alphabets S and L.

All our patients were prescaned in the premedication room on the day of surgery. The patients were brought to the operation room and intravenous access obtained with appropriate size venous cannula. Intravenous fluid Ringer's lactate was started. Standard monitors like Pulse Oximeter, Noninvasive Blood pressure, ECG, Intubation was done under general anesthesia with appropriate size cuffed endotracheal tube by using direct laryngoscopy. The USG guided IJV cannulations were done by the author. The observations were noted by a theater staff nurse, who did not know about the aim and outcome of the study.

The procedure was done using the 10MHZ ultrasound linear probe under sterile technique. First water based jelly was applied to the probe and a sterile cover placed over the probe. Care was taken to remove the air between the probe and the cover. For improving the quality of the images we used sterile water based jelly outside the cover for skin contact.

After induction and intubation of the patient, head turned to opposite side up to 30°angle[23]. Head down position up to 10° was given for venous engorgement during the procedure[24]. The probe marker oriented to patients left side, corresponding marker on the screen. 2% chlorhexidine in alcohol was used for skin preparation.

GROUP S

In group S, the Ultrasound guided IJV cannulation was using the SHORT AXIS technique. In this technique, the right IJV was viewed by placing the ultrasound probe at the level of cricoid cartilage perpendicular to the direction of the vein. Both the carotid artery and the IJV were visualised in the monitor as a cross sectional view. The IJV was kept focused in the centre of the screen. A needle attached with a syringe was advanced at a 45° angle with gentle aspiration out of plane to the probe. The needle tip was visualised as a white dot in the screen. Entry into the IJV was confirmed by the needle indenting the anterior wall of the vein and subsequent aspiration of non-pulsatile venous blood in the syringe. The guide wire was then threaded and the position of guide wire was confirmed by visualising the wire along the short axis plane. Catheterisation was done by Seldinger technique.

GROUP L

In group L, the Ultrasound guided IJV cannulation was done using the LONG AXIS technique. In this technique, the right IJV was first viewed by placing the ultrasound probe at the level of cricoid cartilage in short axis view. Both the carotid artery and the IJV were visualised in the monitor as a cross sectional view. The IJV was kept focused in the centre of the screen. Then the probe was rotated 90° to obtain a longitudinal view of the IJV. A needle attached with a syringe was advanced at a 30° angle in plane to the probe with gentle aspiration. The entire needle was visualised as a white line in the screen. Entry into the IJV was confirmed by the needle indenting the anterior wall of the vein and subsequent aspiration of non-pulsatile venous blood in the syringe. The guide wire was then threaded and the position of guide wire was confirmed by visualising the wire along the long axis plane. Catheterisation was done by Seldinger technique.

PARAMETERS OBSERVED

1. FIRST PASS SUCCESS RATE

The rate of successful internal jugular vein cannulation in a single needle attempt.

2. NUMBER OF NEEDLE ATTEMPTS

Defined as the number of times the needle was withdrawn and redirected till successful cannulation.

3. TIME TAKEN FOR INSERTION OF GUIED WIRE

Defined as the time from the first needle entry to the ultrasound confirmation of presence of the guide wire within the vein.

4. TIME TAKEN FOR CATHETER PLACEMENT

Defined as the time from the confirmation of presence of the guide wire within the vein to the successful aspiration of venous blood from the lumen of the catheter.

5. ARTERIAL PUNCTURE

Carotid artery puncture rate

OBSERVATION AND RESULTS

This study comprised of two groups. The patients were randomly selected.

Group-S: The right internal jugular vein of 30 patients was cannulated by using ultrasound short axis view.

Group-L: The right internal jugular vein of 30 patients was cannulated by using ultrasound long axis view.

Methods of Statistical Analysis

The data were analysis using SPSS (Statistical Package for Social Science) Ver 16.01. The data collected were scored and analyzed, Continues variables were presented as means with Standard deviation (sd) and categorical variables were presented as frequency and percentages. Student t-test was used for testing the significance of all the variables (Mean & Sd) in both the group. Qualitative data was analyzed by using Chi square test. All the Statistical results were considered significant at P value < 0.05.

Analysis of Observations and results

1: Age Distribution

Age distribution in the short axis view group was varies from 20 years to maximum of 60 years, with a mean value of 39.37 years, and standard deviation of 13.57.

Age distribution in the long axis view group was varies from 20 years to maximum of 60 years, with the mean value of 39.73 years, and standard deviation of 11.73 (As shown in table.1)

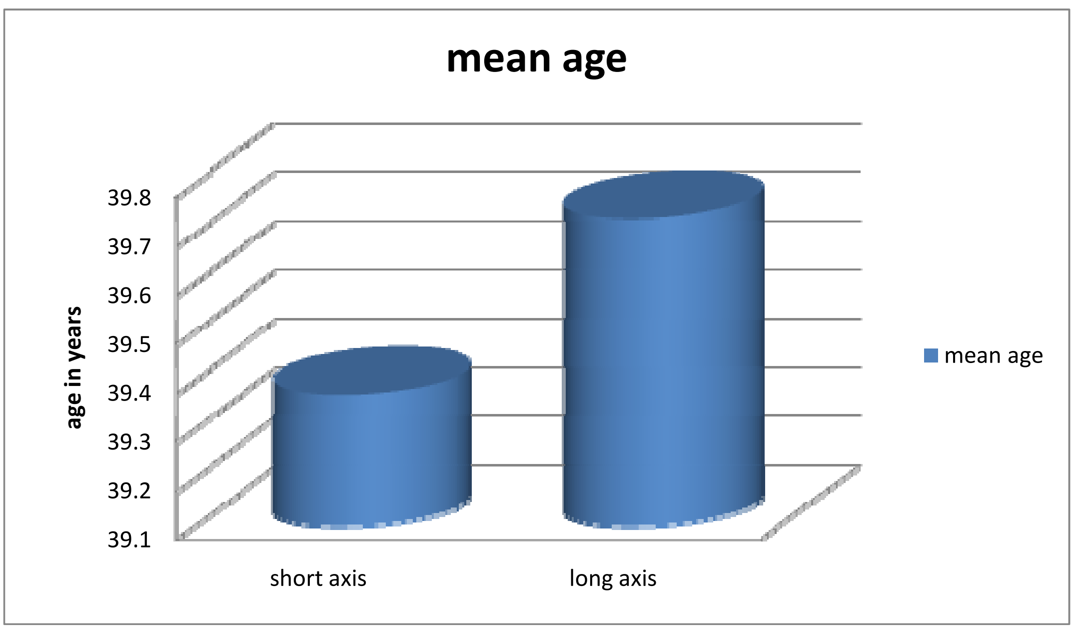
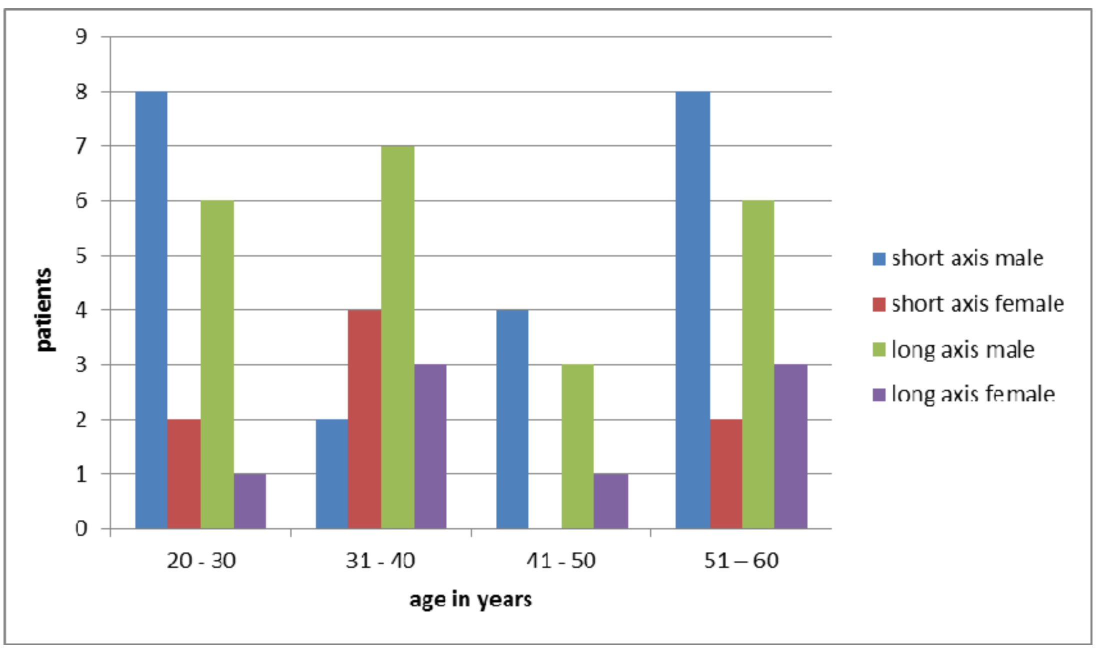


Table-1 Age Distribution of the Study Sample

	Short Axis		Long Axis		Total	
	MALE	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**
20 - 30	8	2	6	1	14	3
31 - 40	2	4	7	3	9	7
41 - 50	4	0	3	1	7	1
51 – 60	8	2	6	3	14	5
Mean (sd)	**39.37 (13.57)**		**39.73 (11.73)**		**39.55 (12.52)**	
T-value p-value	0.11 0.91 (Not Significant**)**					

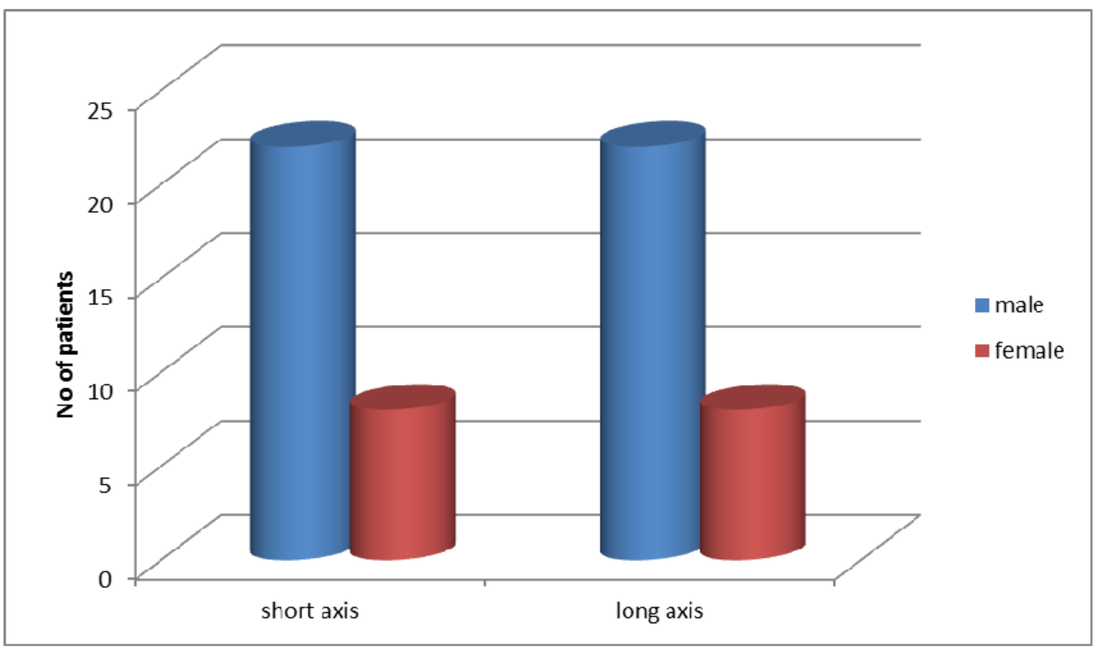


2: SEX DISTRIBUTION

Sex distributions in short axis group - males were 22, and the rest were females and in long axis group – males were 22, and the rest were females. (As shown in table 2). The P value is not significant.

Table-2 Sex **distribution of the Sample**

Sex	Short Axis N=30		Long Axis N=30		Total N=60	
	N	**%**	**N**	**%**	**N**	**%**
Male	22	73.30	22	73.30	44	73.30
Female	08	26.70	08	26.70	16	26.70
Ratio	**22:08**		**22:08**		**44:16**	
Chi-square value	**0.001**					
p-value	**1.00 (Not Significant)**					

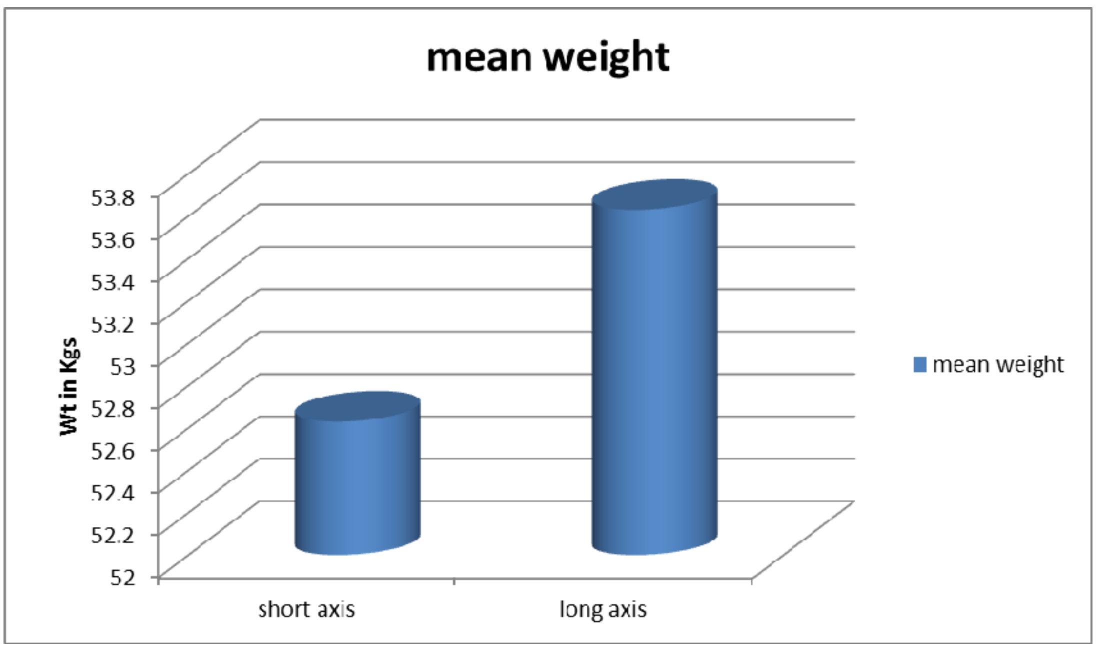


3: WEIGHT

In short axis view the mean weight was 52.63 and in long axis the weight was 53.63kgs. The p value is not significant.

Table-3 Weight in Kgs

Sex	Short Axis	Long Axis
Mean	52.63	53.63
Sd	4.45	5.04
t-Value	0.815	
p-value	0.42 (Not Significant)	

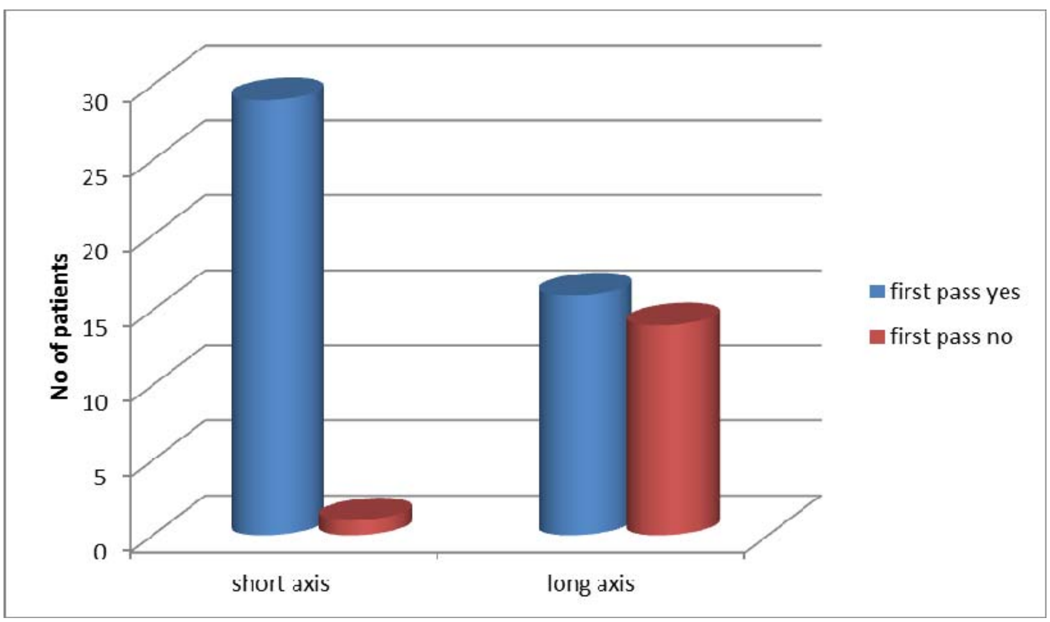


4: FIRST PASS SUCCESS RATE

In group S the first pass success rate was 96.70% and in group L was 53.30%. The p value was significant (p= 0.0001).

Table-4 First Pass

First Pass	Short Axis		Long Axis	
	N	**%**	**N**	**%**
Yes	29	96.70	16	53.30
NO	1	3.30	14	46.70
Total	**30**	**100**	**30**	**100**
Chi square Value	**15.02**			
p-value	**0.0001 (Significant)**			



5: NUMBER OF ATTEMPTS

In short axis view single attempt was made in 29 cases (96.7%) and 2 attempts in 1 case (3.3%). In long axis view single attempt was made in 16 cases (53.3%), 2 attempts in 11 cases (36.7%) and 3 attempts in 3 cases (10%).

Applying Chi square tests, it was found to be statistically significant. The 'p' value of 0.0001 was statistically significant. (Table: 5&6)

Table-5 No of needle passes

	Short Axis	Long Axis
Mean	1.03	1.57
Sd	0.18	0.68
t-Value	4.16	
p-value	0.0001 (Significant)	

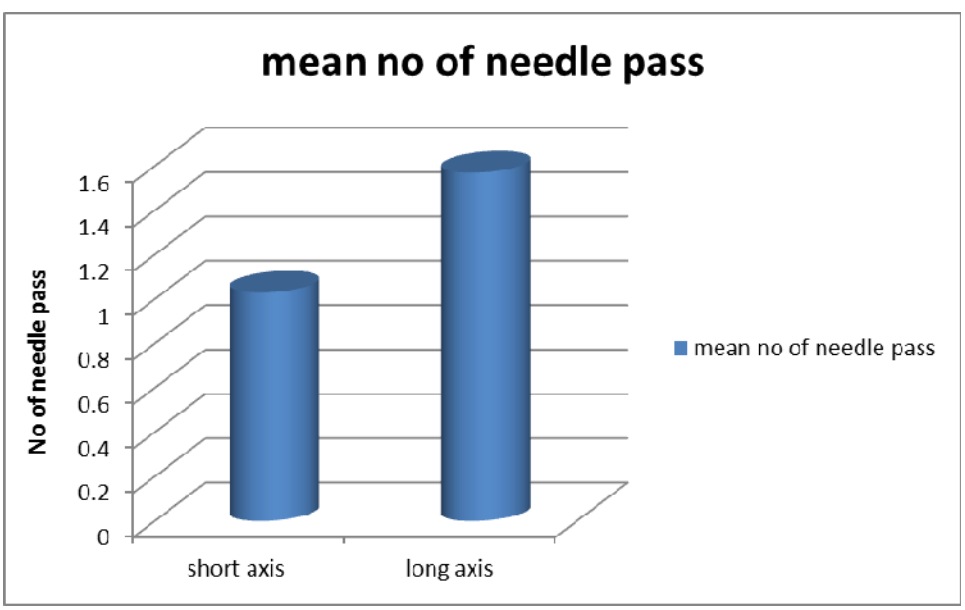
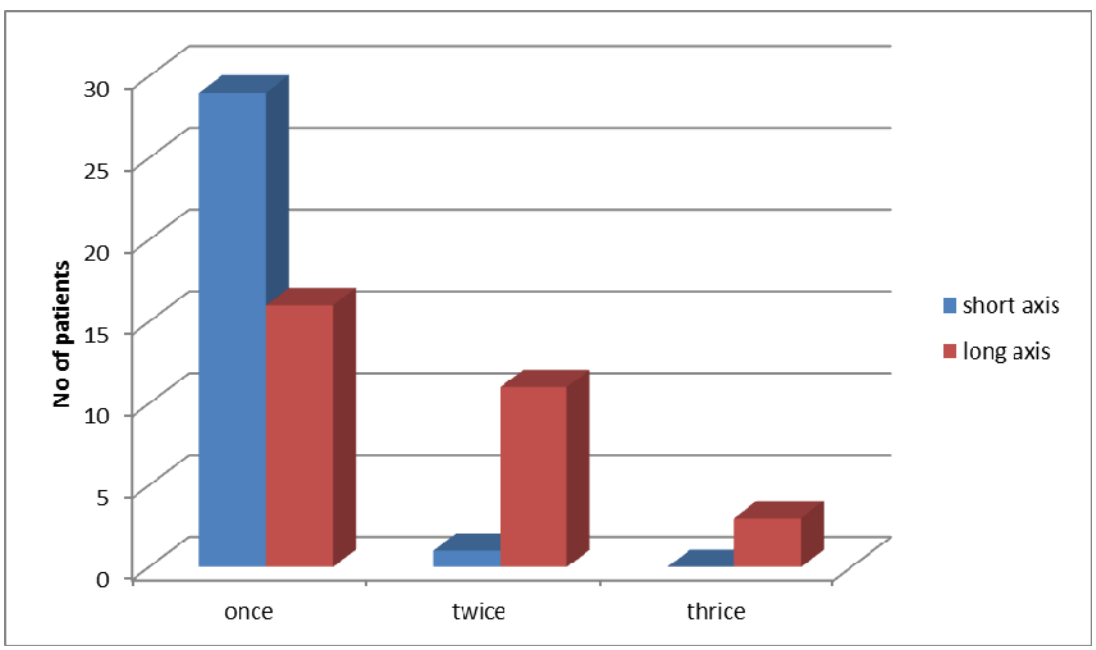


Table-6 **No of needle passes**

No of Needle Passes	Short Axis		Long Axis		Total	
	N	**%**	**N**	**%**	**N**	**%**
Once	29	96.70	16	53.30	45	75.00
Twice	1	3.30	11	36.70	12	20.00
Thrice	0	0	3	10.00	3	5.00
Min	1		1		1	
Max	2		3		3	
Chi-square Value	15.09					
p-value	0.0001 (Significant)					



6: PROCEDURE TIME FOR GUIDE WIRE PLACEMENT

Time to perform the guide wire placement in short axis view was taken as, the mean of 42.2 seconds, and the standard deviation of 6.64. In long axis view group, time to perform guide wire placement was taken as, the mean of 73.83seconds, and the standard deviation of 38.36. The ‘p’ value was significant. (Table: 7&8)

Table-7 Time taken to guide wire placement in seconds

	Short Axis	Long Axis
Mean	42.20	73.83
Sd	6.64	38.36
t-Value	4.45	
p-value	0.0001 (Significant)	

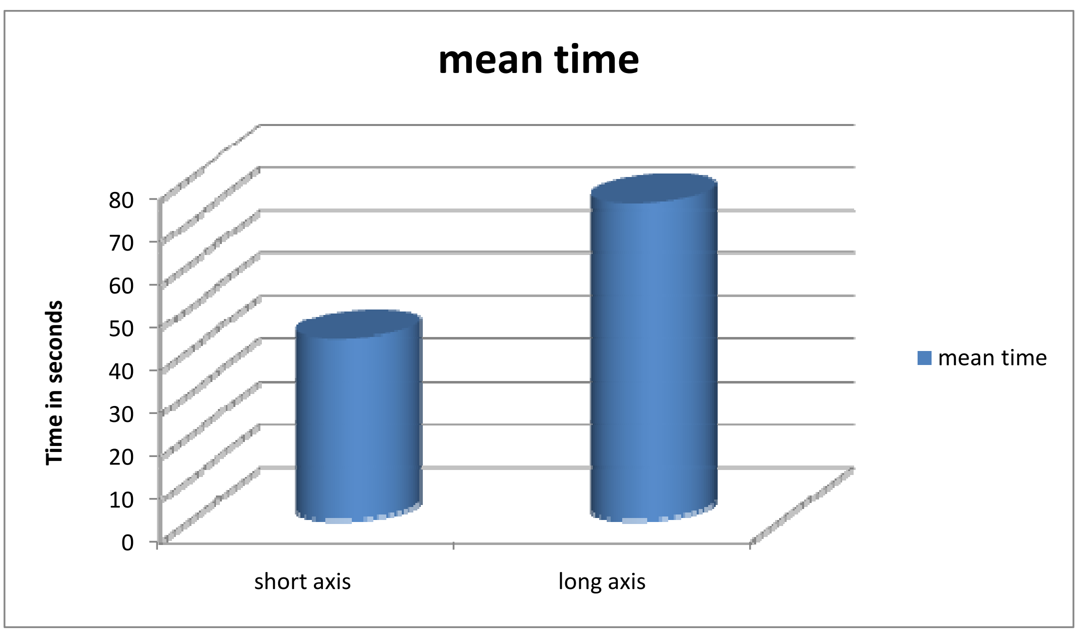
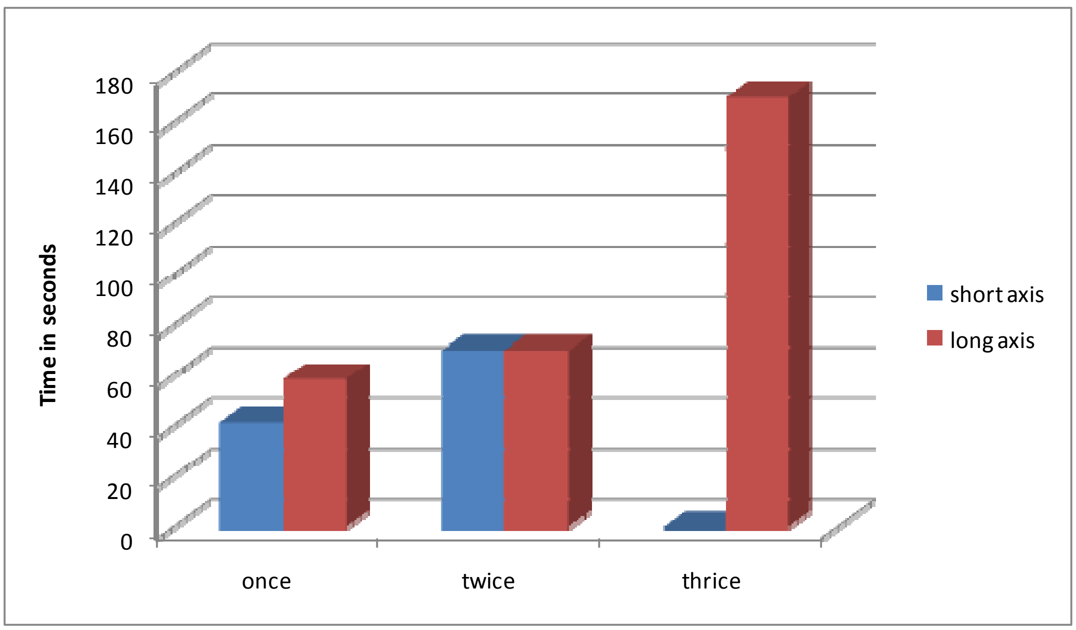


Table-8 **Time (Seconds) taken for guide wire placement**

No of Needle Passes	**Short Axis**		**Long Axis**				
	Mean	**Sd**	**Mean**	**Sd**	**t-value**	**Df**	**p-value**
once	41.24	4.14	58.50	7.88	9.67	43	0.0001
Twice	70	0	69.91	5.22	0.017	10	0.99 (NS)
Thrice	-	-	170.0	70.00	-	-	-
Total	**42.20**	**6.64**	**73.83**	**38.36**	**4.450**	**58**	**0.0001**



7: PROCEDURE TIME FOR CATHETER PLACEMENT

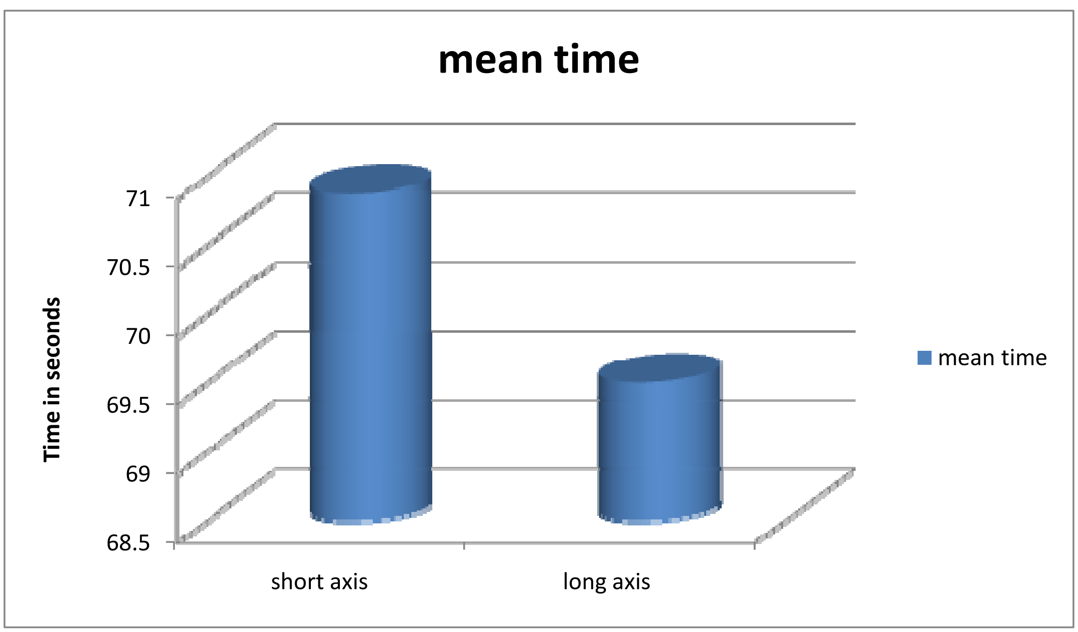
The mean time taken for catheter placement in the short axis view was around 70.89seconds and standard deviation was 5.52

The mean time taken for catheter placement in the long axis view was around 69.50 seconds and standard deviation was 4.59

The p value was not statistically significant. (p =0.301)

Table-9 Time taken for Catheterization in seconds

	Short Axis	Long Axis
Mean	70.87	69.50
Sd	5.52	4.59
t-Value	1.104	
Significant	0.301 (Not Significant)	

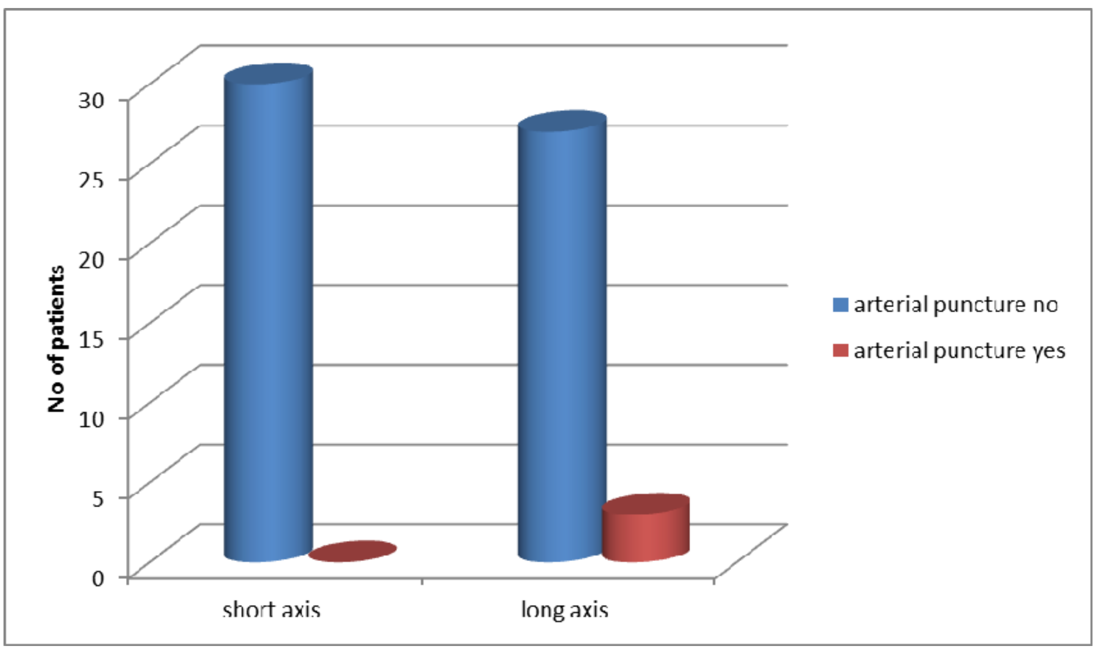


8: ARTERIAL PUNCTURE

The number of carotid artery puncture in short axis group was nil (0%). In long axis group it was 3 (10%). Applying Chi square tests, the 'p' value was which is statistically insignificant. (Table 6, fig 3)

Table-10 Arterial Puncture

Arterial Puncture	Short Axis		Long Axis		Chi-square	p-value
	N	%	N	%		
No	30	100	27	90.00	3.16	0.08 Not Significant
Yes	0	0	3	10.00		



DISCUSSION

The central venous cannulation required for various purposes was done previously using surface landmark guided technique. This technique is associated with complications like carotid artery puncture, hematoma, and pneumothorax[3, 5].

The complication rates where high when the blind technique is used in patients who are sick, short neck, altered anatomy and abnormal coagulopathy. The complication rates are high in the blind technique due to difficulty in finding the IJV and increased number of needle attempts to find the IJV[3, 5].

Introduction of ultrasound in the anesthesia clinical practice reduces the complication rates related to the IJV cannulation. In ultrasound guided internal jugular vein cannulation technique direct visualization of the vein and the needle during the procedure will reduce the number of needle attempts and increase the first pass success rate [6, 25].

In ultrasound guided technique also the complications like carotid artery puncture[5, 20] can occur but comparing to the blind surface landmark guided technique the complication rates were minimal.

Several studies like **Dimitrios Karakitsos[10] et al, Dodge KL [11] et al, Keenan SP [12] et al,** have sought to compare both the landmark guided technique and the Ultrasound guided technique of internal jugular vein cannulation with respect to success rate, procedure time and complications. Most of the studies observed a conclusive evidence that ultrasound definitively improve the effective cannulation of the IJV with the least possible complications.

Initially two approaches of IJV cannulation using USG were described, Short (transverse) axis and the long (longitudinal) axis[6]. Studies that compared the short axis and long axis approaches observed a significant difference in the time taken, success rate and complications between the two study groups. The short axis approach had been postulated to give better first pass success rate and lesser complications[19,20].

In 2003, **Blaivas[19] et al** compared the short axis and long axis approaches for USG guided cannulation in an inanimate model using amateur users. They observed a significant reduction in needle attempts and time taken for the short axis approach compared to long axis approach.

In 2011, **Suresh Chittoodan[20] et al** studied the hypothesis that short axis is better than long axis for USG guided IJV cannulation. This study was performed first time in humans with an experienced user and found that the short axis approach was significantly better than long axis approach.

We decided to test the hypothesis that short axis is better than long axis approach for USG guided IJV cannulation with respect to the first pass success rate.

In our institution the central venous cannulation was previously done under surface landmark guided technique. After the ultra sound machine was procured in our department, central venous cannulation was done under ultra sound guided technique. After the introduction of ultrasound for central venous cannulation in our department the success rate was increased, time required for the procedure and the complications were reduced.

The ultra sound guided central venous cannulation is done in both awake and anaesthetized patients. In awake patients the technique was done under local anesthesia in the ICU. All patients in our study were surgical patients who were given general anesthesia and hence cannulation was done after induction.

Patients for emergency surgeries are not included because of logistic problems in getting the ultrasound machine in our emergency Operation Theater. But in various studies like **Julle leung** [15] et al, shows that the ultrasound guided central venous cannulation in the emergency setting will increase the first pass success rate and reduces the complication.

Even though the complication rates are minimal in ultrasound guided central venous cannulation, there are situations where the complication rates high[3, 5]. So patients with the svc syndrome, renal cell tumor invading the right atrium, carotid artery atheroma and abnormal coagulopathy are excluded from our study.

Chittoodan et al[20] found that the first pass success rate was 98% in the short axis view and 78 % in long axis view. In their study the overall success rate was 100% in both the groups. In our study we found that the first pass success rate of 96.7% for short axis view and 53.30% for long axis view which is statistically significant result similar to the above study. We also found that the overall success rate was100% success in both the groups.

During our study we also noted few other interesting data which was statistically significant and which also emphasizes that the USG guided short axis approach to IJV cannulation is better than the long axis approach.

Chittoodan et al[20] found that the mean number of needle pass was 1.02 and the standard deviation was 0.02 in short axis view. In the long axis view the mean was 1.24 and standard deviation was 0.56. In our study we found that the mean number of needle pass was 1.03 and the standard deviation was 0.18 in short axis view which is similar to the chittoddan et al study.

But in our study the mean number of needle pass in the long axis view was 1.57 and standard deviation was 0.68 which is higher than the chittoddan et al study. The reason for the higher mean value of the long axis approach in our study could be, because the long axis approach needed more hand eye coordination than the short axis approach. In cross sectional view or SA view the foot print of the ultrasound probe is wide and the artery, vein are simultaneously seen in the screen. Hence in short axis technique the required number of needle attempts is reduced. In contrast to cross sectional view or SA view, the longitudinal or LA view the foot print of the ultrasound probe is narrow and the artery, vein are not simultaneously seen in the screen.

In our study we found that the mean time taken for guide wire placement in short axis view was 42.2 and standard deviation was 6.64.Chittoodan et al found that the mean time taken for guide wire placement in short axis view was 39.6 and standard deviation was 18.4.

But in our study long axis cannulation technique the mean time taken for guide wire placement was 73.83 and standard deviation was 38.36 which was statistically significant compare to that of short axis view cannulation. Chittoodan et al found that in long axis cannulation technique, the mean time taken for guide wire placement was 46.9 and standard deviation was 42.4 which was not statistically significant compare to that of short axis view cannulation.

In our study the reason for higher the mean time taken for guide wire placement in long axis cannulation technique could be , in this approach first the short axis view was obtained then only the view is converted into long axis view. For any reason if the first attempt is not successful, once again the above technique must be repeated. This could be the cause for increase in time. In our study the long axis view maximum number of needle attempt was 3. Hence in our study the mean time taken for long axis cannulation technique was increased compared to short axis view.

In our study we also found that the mean time taken for catheter placement in short axis view was 70.87 and standard deviation was 5.52. In long axis the mean time taken for guide wire placement was 69.5 and standard deviation was 4.59 which were not statistically significant. This shows that the time difference only occurred up to guide wire placement, after that there is no time variation in both the groups.

Chittoodan et[20] al found that the carotid artery puncture rate was around 4% in long axis view and nil in short axis view. In our study we found that the carotid artery puncture rate was around 10% in long axis view and nil in short axis view which was not statistically significant. the Carotid artery puncture was more in long axis than the short axis may be due to the long axis cannulation needs more hand eye coordination, where as in short axis view both the vein and artery are seen simultaneously on the screen.

One of the limitations of this study is that double blinding was not possible for recording insertion time and number of attempts, as the insertion technique could not be disguised. However, to minimize the bias, insertion time and number of attempts were recorded by an observer not involved in the study and who was unaware of the purpose and nature of the study.

SUMMARY

From our study we found that cannulation of right internal jugular vein using the ultrasound via short axis view is a better method compared to long axis view in terms of first pass success rate.

During our study we also found the following data interesting, useful and statistically significant.

The groups were comparable for age, sex, weight. Our observations were,

- Number of needle attempts required for short axis view technique is lesser than the long axis view technique. It is a statistically significant result.

- Time taken for guide wire placement was shorter in short axis view technique than the long axis view technique. It is a statistically significant result.

- Time taken for catheter placement was increased in short axis view technique than the long axis view technique. It is not statistically significant result.

- Carotid artery puncture is higher in long axis view technique than short axis view technique. It is not statistically significant result.

Hence we felt that ultrasound guided short axis technique to be better than the ultrasound long axis technique for right internal jugular vein cannulation.

CONCLUSION

In conclusion from our study we found that, the short axis view is better than the long axis view for the ultrasound guided central venous cannulation of right internal jugular venous in terms of first pass success rate. This technique also reduces the number of needle attempts required and time for guide wire placement in adult patients.

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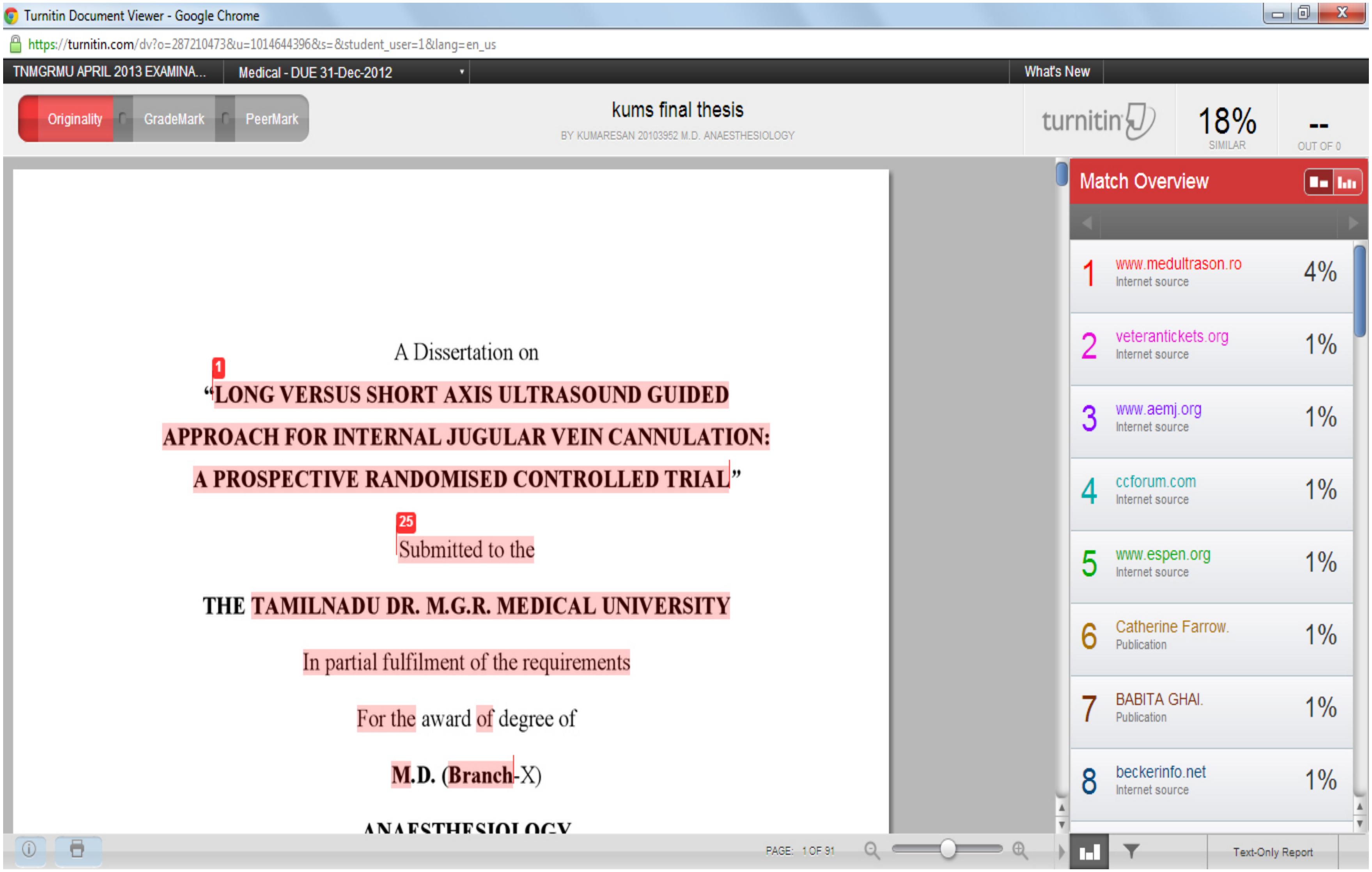
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Submitted to the
THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
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For the award of degree of
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Text-Only Report

PROFORMA

Serial no: Date:

Name: I P no:

Age/Sex: Weight:

ASA: Group: S / L

Diagnosis:

INTRA OP:

VARIABLES	
FIRST PASS SUCCESS	Yes/ No
NO OF NEEDLE PASSES	
TIME TAKEN FOR INSERTION OF GUIED WIRE	
TIME TAKEN FOR CATHETER PLACEMENT	
ARTERIAL PUNCTURE	Yes/ No

Signature of the Observer

SLNO	IP NO	NAME	AGE	SEX	WEIGHT	ASA	STUDY GROUP	DIAGANOSIS	PROCEDURE	FIRST PASS	NO OF NEEDLE PASS	TIME FOR GUIDE WIRE (IN SECONDS)	TIME FOR CATHERISATION (in Seconds)	ARTERIAL PUNCTURE
1	20354	Perumal	44	M	55	iii	S	CAD	CABG	Yes	1	40	65	Nil
2	18932	Anbalagan	38	M	60	iii	L	pseudocyst of pancreas	laparotomy	No	3	90	68	Nil
3	23959	Valarmathy	38	F	50	iii	S	RHD MS	MVR	Yes	1	45	74	Nil
4	23846	Kattan	54	M	60	iii	L	CAD	CABG	No	2	70	65	Nil
5	18392	Boopathy	56	M	50	iii	S	CAD	CABG	Yes	1	45	80	Nil
6	25921	Katamuthu	54	M	60	iii	L	CAD	CABG	Yes	1	50	68	Nil
7	24935	Balasundaram	55	M	55	iii	S	Periampullary growth	whipples	Yes	1	40	76	Nil
8	20193	Ramalingam	33	M	55	iii	S	L bronchiectasis	L pneumonectomy	No	2	70	72	Nil
9	23779	Anbarasan	25	M	50	iii	L	VSD	VSD closure	No	3	200	68	Yes
10	19724	Senthilkumar	42	M	55	iii	L	RHD MS	MVR	Yes	1	40	65	Nil
11	19818	Saraswathy	30	F	50	iii	L	Diaphragmatic hernia	repair	No	2	65	80	Nil
12	22641	Annapoorni	35	F	50	iii	L	RHD MS	MVR	No	2	80	68	Yes
13	22056	Sarojini	40	F	56	iii	S	RHD MS	MVR	Yes	1	45	76	Nil
14	21524	Palani	46	M	48	iii	S	Left lower lobe bronchiectasis	L lower lobectomy	Yes	1	47	68	Nil
15	22094	Esther	41	F	42	iii	L	RHD MS	MVR	No	3	220	74	Yes
16	27232	Maheshwari	40	F	45	iii	L	RHD MS	MVR	Yes	1	60	66	Nil
17	28686	Rajaganesh	24	M	52	iii	S	RHD MS	MVR	Yes	1	52	68	Nil
18	27649	Krishnaveni	55	F	46	iii	S	CAD	CABG	Yes	1	48	70	Nil
19	24020	Jayammal	54	F	48	iii	L	CA sigmoid colon	laparotomy	Yes	1	44	72	Nil
20	28884	Harvindar paswan	46	M	62	iii	L	CAD	CABG	No	2	74	68	Nil
21	27041	Boopathy	49	M	52	iii	L	RHD MS	MVR	Yes	1	68	66	Nil
22	28727	Munusamy	53	M	58	iii	L	CRF	RENAL TRANSPLANT	No	2	76	74	Nil
23	30178	Elamraj	29	M	56	iii	S	RHD MS	MVR	Yes	1	47	75	Nil
24	30658	Kuppan	57	M	63	iii	S	CRF	RENAL TRANSPLANT	Yes	1	48	80	Nil
25	28448	Chellamal	23	F	45	iii	S	RHD MS	MVR	Yes	1	40	74	Nil
26	31694	Veerasamy	55	M	57	iii	L	CA Sigmoid colon	laparotomy	Yes	1	57	69	Nil
27	30712	Sankar	52	M	53	iii	S	pseudocyst of pancreas	laparotomy	Yes	1	40	74	Nil
28	29347	Arumugam	56	M	58	iii	L	CA colon	laparotomy	No	2	64	64	Nil
29	29625	Baby	56	F	50	iii	S	CA sigmoid colon	laparotomy	Yes	1	38	78	Nil
30	31782	Mathivanan	31	M	57	iii	L	RHD MS	MVR	No	2	65	66	Nil
31	32593	Dharman	56	M	54	iii	S	CAD	CABG	Yes	1	36	65	Nil
32	29907	Malliga	51	F	54	iii	L	CAD	CABG	Yes	1	58	66	Nil
33	29011	Chandrababu	57	M	57	iii	S	ca rectum	laparotomy	Yes	1	42	62	Nil
34	25639	Pongavanam	55	F	54	iii	L	Periampullary growth	whipples	Yes	1	59	70	Nil
35	28171	Ramesh	45	M	59	iii	S	CRF	RENAL TRANSPLANT	Yes	1	37	64	Nil
36	32028	Shyed	23	M	53	iii	L	RHD MS	MVR	No	2	69	72	Nil
37	32026	Chelladurai	51	M	58	iii	S	CRF	RENAL TRANSPLANT	Yes	1	41	75	Nil
38	31774	Dilibabu	35	M	60	iii	L	RHD MS	MVR	Yes	1	61	70	Nil
39	32541	Ramamoorthy	43	M	54	iii	S	RHD MS	MVR	Yes	1	40	65	Nil
40	32245	Raja	28	M	53	iii	L	RHD MS	MVR	No	2	67	66	Nil
41	32506	Vijayanirmala	38	F	50	iii	S	RHD MS	MVR	Yes	1	37	68	Nil
42	31829	Arun	22	M	53	iii	L	VSD	VSD closure	Yes	1	63	74	Nil
43	31857	Ilayaraja	30	M	48	iii	S	VSD	VSD closure	Yes	1	41	75	Nil
44	31424	Babu	35	M	51	iii	L	RHD MS	MVR	Yes	1	62	78	Nil
45	32456	Ganesan	34	M	55	iii	S	RHD MS	MVR	Yes	1	37	80	Nil
46	32470	Velu	20	M	57	iii	L	VSD	VSD closure	No	2	66	80	Nil
47	31769	Revathi	29	F	49	iii	S	RHD MS	MVR	Yes	1	41	62	Nil
48	32378	Krishnan	38	M	53	iii	L	Periampullary growth	whipples	Yes	1	59	66	Nil
49	31739	Rajamani	22	M	52	iii	S	RHD MS	MVR	Yes	1	37	70	Nil
50	32418	Sakirabanu	39	F	47	iii	L	RHD MS	MVR	Yes	1	65	64	Nil
51	32228	Chinnakoundar	20	M	55	iii	S	RHD MS	MVR	Yes	1	38	66	Nil
52	32470	Miller	37	M	53	iii	L	RHD MS	MVR	Yes	1	57	68	Nil
53	30167	Asibul	20	M	56	iii	S	ASD	VSD closure	Yes	1	38	72	Nil
54	32610	Rajendra	20	M	49	iii	L	VSD	VSD closure	No	2	73	74	Nil
55	32085	Annapurani	31	F	44	iii	S	RHD MS	MVR	Yes	1	40	74	Nil
56	32875	Manimaran	35	M	60	iii	L	RHD MS	MVR	Yes	1	67	72	Nil
57	31223	Nandakumar	21	M	55	iii	S	RHD MS	MVR	Yes	1	38	68	Nil
58	31558	Sudhakar	20	M	53	iii	S	VSD	VSD closure	Yes	1	40	66	Nil
59	32829	Sekar	51	M	48	iii	L	DU perforation	laparotomy	Yes	1	66	64	Nil
60	32351	Kumar	56	M	46	iii	S	CA Colon	laparotomy	Yes	1	38	64	Nil

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

அல்ட்ரா சவுண்ட் ஸ்கேன் (USG) உதவியுடன் இன்டர்னல் சூகுலார் வேயின் (IJV) கேனுலேசன் - குறுக்கு (Short) மற்றும் நெடு(Long) வாக்கு முறைகளை ஒப்பிடும் ஆய்வு

ஆராய்ச்சி நிலையம் : அரசு ஸ்டான்லி மருத்துவமனை
சென்னை - 600 001.

பங்கு பெறும் நோயாளியின் பெயர் : வயது :

பங்கு பெறும் நோயாளியின் எண் : பாலினம் : ஆண் ☐ பெண் ☐

நோயாளியின் விலாசம் :

நோயாளி இதனை (✓) குறிக்கவும்.

மேலே குறிப்பிடப்பட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும். அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் என்னை இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்க அனுமதிக்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் என்னை இவ்வாய்வில் இருந்து விலக்கி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னை மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். என்னை ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் என்னை ஈடுபடுத்த முழுமனதுடன் ஒப்புக் கொள்கிறேன். இந்த மயக்க மருந்துகள் மற்றும் மயக்க முறையினால் ஏற்படக்கூடிய பின் விளைவுகள் மற்றும் எதிர்பாராத விளைவுகள் பற்றி எனக்கு விளக்கமாக தெரிவிக்கப்பட்டது. ☐

இந்த ஆய்வில் உங்களுக்கு அறுவை சிகிச்சைக்கு முன் இரத்த நாளத்தில் சிறு ஊசி செலுத்தப்பட்டு அதன் மூலம் மயக்க மருந்து கொடுத்து, உங்கள் மூச்சுக் குழாயில் என்டோ ட்ரக்கியல் டியூப், செலுத்தி முழு மயக்கம் கொடுக்கப்படும். பின்பு அல்ட்ரா சவுண்ட் ஸ்கேன் உதவியுடன் இன்டர்னல் சூகுலார் வேயின் கேனுலேசன் குறுக்கு மற்றும் நெடு வாக்கு முறைகளில் ஏதேனும் ஒன்று பின்பற்றப்படும்.என்பதை அறிந்து அதற்கு முழுமனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில், என் நலன் கருதியே பங்கேற்கிறேன். ☐

நோயாளியின் கையொப்பம் .... இடம் .... தேதி

கட்டைவிரல் ரேகை (இந்த படிவம் படித்து காட்டப்பட்டு புரிந்து கைரேகை அளிக்கின்றேன்)

ஆய்வாளரின் கையொப்பம் .... இடம் .... தேதி

ஆய்வாளரின் பெயர் ....

உண்டாக கூடிய இடர்கள் :

அனைத்து மயக்க மருந்து மற்றும் மயக்க முறைகளுடன் இருப்பது போலவே இந்த முறையிலும் சில எதிர்பாரா இடர்கள் நடைபெறலாம். இன்டர்னல் சூகுலார் வேயின் கேனுலேசன் செய்யும் போது இரத்த நாளங்களில் காயம் போன்ற விளைவுகள் ஏற்பட வாயப்புள்ளது.

ஆய்வில் உங்கள் உரிமைகள் :

உங்கள் மருத்துவப் பதிவேடுகள் மிகவும் அந்தரங்கமாக வைத்துக் கொள்ளப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் பிரசுரிக்கப்படலாம். ஆனால், பெயரை வெளியிடுவது மூலம் உங்களின் அடையாளம் வெளிக்காட்டப்படமாட்டது. இந்த ஆய்வில் உங்களின் பங்கேற்பு தன்னிச்சையானது மற்றும் காரணங்கள் எதையும் கூறாமலேயே நீங்கள் இந்த ஆய்விலிருந்து எந்த ஒரு நேரத்திலும் விலக்கிக் கொள்ளலாம். எப்படியிருந்தாலும் உங்களுக்கு தகுந்த மயக்க மருந்து கொடுத்து அறுவை சிகிச்சை செய்யப்படும். இந்த ஆய்வில் ஏதேனும் பக்க விளைவுகள் ஏற்பட்டால் உங்களுக்கு முழு சிகிச்சை மருத்துவ குழுவினரால் அளிக்கப்படும்.

நாள் :

நோயாளியின் கையொப்பம்
இடது பெருவிரல் ரேகை
(மருத்துவரால் படித்துகாட்டப்பட்டது)

நோயாளி தகவல் தாள்

அல்ட்ரா சவுண்ட் ஸ்கேன் (USG) உதவியுடன் இன்டர்னல் சூகுலார் வேயின் (IJV) கேனுலேசன் - குறுக்கு (Short) மற்றும் நெடு(Long) வாக்கு முறைகளை ஒப்பிடும் ஆய்வு

நோயாளிக்கான தகவல்கள் :

ஆராய்ச்சின் நோக்கமும், ஆதாரங்களும் :

உங்களுக்கு திட்டமிட்டப்பட்டுள்ள இந்த மருத்துவ ஆராய்ச்சி ஆய்வானது, அறுவை சிகிச்சையின் போது அல்ட்ரா சவுண்ட் ஸ்கேன் (USG) உதவியுடன் இன்டர்னல் சூகுலார் (IJV) வேயின் கேனுலேசன் -குறுக்கு (Short) மற்றும் நெடு (Long) வாக்கு முறைகளை ஒப்பிடும் ஆய்வு.

பொதுவாக இத்தகைய இன்டர்னல் சூகுலார் (IJV) வேயின் கேனுலேசன் ஆனது. உடற்கூரியல் புள்ளிகளை (Anatomical Landmark) வைத்து செய்யப்படும் இதனால் பல பிரச்சினைகள் ஏற்பட வாய்ப்புள்ளது.

அல்ட்ரா சவுண்ட் ஸ்கேன் உதவியுடன் இன்டர்னல் சூகுலார் வேயின் கேனுலேசன் செய்யும் போது இத்தகைய பிரச்சனைகளை குறைக்கலாம். இதில் குறுக்கு மற்றும் நெடு வாக்கு முறைகளை ஒப்பிடும் போது இதிலுள்ள நன்மைகளையும் பக்கவிளைவுகளையும் ஒப்பிடமுடியும்.

ஆய்வு முறை :

இந்த ஆய்வில் உங்களுக்கு அறுவை சிகிச்சைக்கு முன் இரத்த நாளத்தில் சிறு ஊசி செலுத்தப்பட்டு அதன் மூலம் மயக்க மருந்து கொடுத்து, உங்கள் மூச்சுக் குழாயில் என்டோ ட்ரக்கியல் டியூப், செலுத்தி முழு மயக்கம் கொடுக்கப்படும். பின்பு அல்ட்ரா சவுண்ட் ஸ்கேன் உதவியுடன் இன்டர்னல் சூகுலார் வேயின் கேனுலேசன் குறுக்கு மற்றும் நெடு வாக்கு முறைகளில் ஏதேனும் ஒன்று பின்பற்றப்படும்.

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Long Versus short Axis ultrasound Guided Approach For internal juglular vein cannulation : A Prospective Randomized controlled Trial

Principal Investigator : Dr. M.Kumaresan

Designation : PG in MD (Anaes)

Department : Department of Anaesthesia
Government Stanley Medical College,
Chennai-1

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 06.03.2012 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate form the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

19/7/12

MEMBER SECRETARY,
IEC, SMC, CHENNAI

STANLEY MEDICAL COLLEGE
10 JUL 2012
CHENNAI-600001.